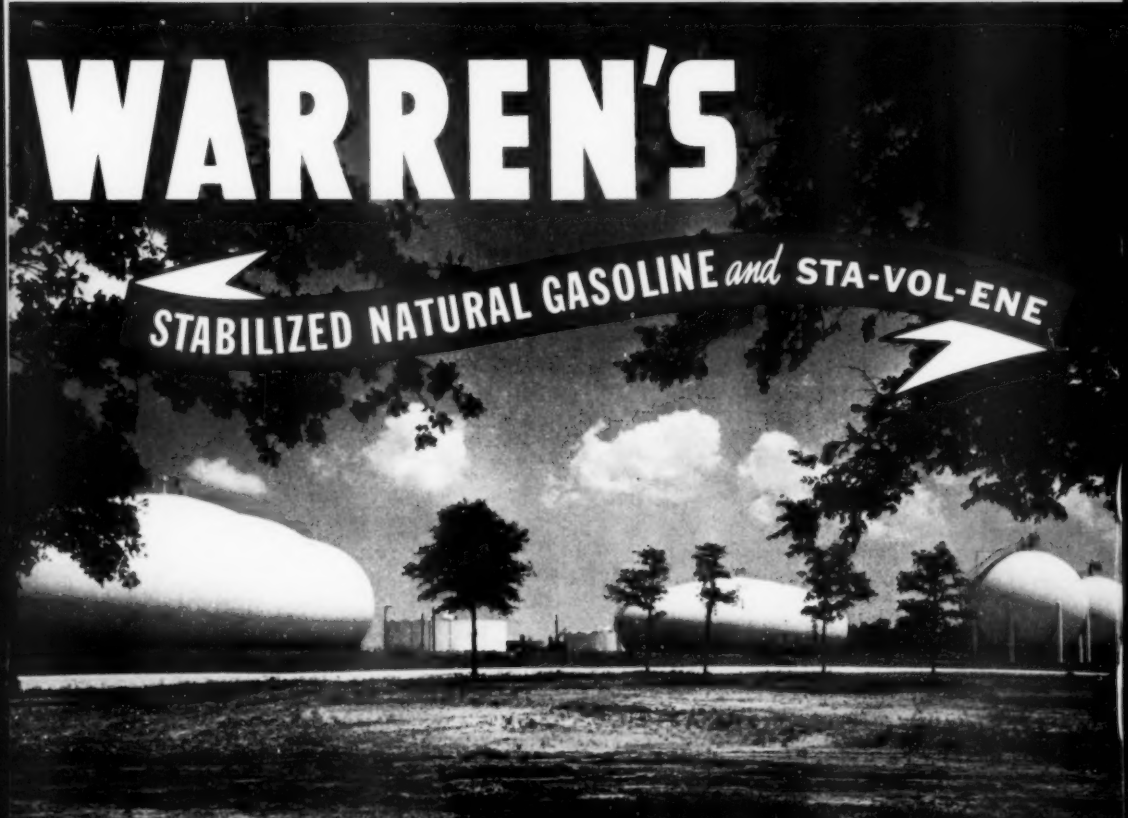
the OIL AND GAS JOURNAL

WARREN'S

STABILIZED NATURAL GASOLINE and STA-VOL-ENE



Ready for the Nation's Refiners

WARREN PETROLEUM CORPORATION

Producers, Manufacturers, Exporters and Marketers

Export Terminals: Corpus Christi, Port Arthur, Baytown, Texas City, and Norsworthy, Houston, Texas.

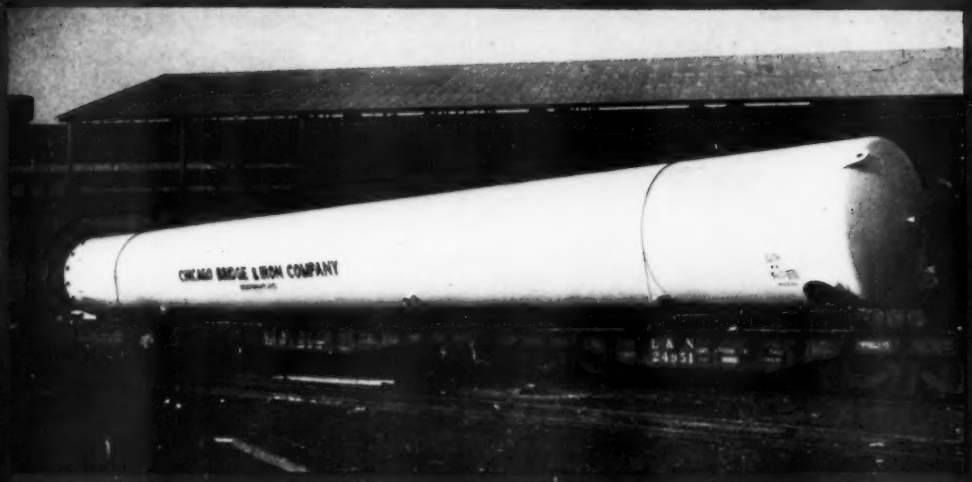
TULSA 2, OKLAHOMA CABLE ADDRESSES: Stavolene, Warren

WARREN'S NORSWORTHY, TEXAS TERMINAL

Crude Oil, Natural Gasoline and Liquefied Petroleum Products

PRICE 50 CENTS TABLE OF CONTENTS PAGE 33 **AUGUST 2, 1951**

On the way to Argentina



Crude Fractionator built by Chicago Bridge & Iron for South American Refinery

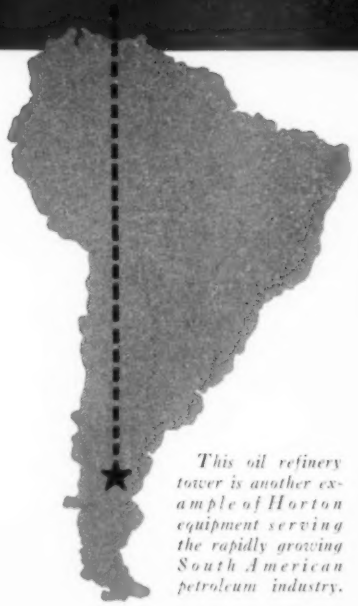
This 10 ft. diam. by 110 ft. crude fractionator is heading south to a large refinery in Argentina. It was carefully built at one of our shops to the specifications of the M. W. Kellogg Company.

Since this tower will be subject to corrosive service at fairly high temperatures, it has a stainless steel lining in the lower 60 feet, and monel linings in the nozzle above 79 ft. 6 in. The heads were stress-relieved and the entire structure was random x-rayed before shipment.

Refinery towers of this type are only one of the many special steel plate structures we build for the petroleum industry. Other equipment includes Hortonspheres, Hortonspheroids, Horton Floating Roofs, and other vapor-saving storage units.

If you are expanding your present refinery facilities, consider Horton refinery equipment for more efficient, more economical service. Write our nearest office for complete details.

Specify the Phoscote Process when ordering Horton steel structures. It will substantially cut your maintenance costs and result in longer plate life. Write for Bulletin I for details.



This oil refinery tower is another example of Horton equipment serving the rapidly growing South American petroleum industry.

CHICAGO BRIDGE & IRON COMPANY

Things to know before selecting pipe for distribution lines

Bethlehem Oil and Gas Pipe meets the requirements of three specifications: API 5Lx, ASTM A-139 and ASTM A-134.

Bethlehem Oil and Gas Pipe is furnished in 40 ft lengths, with either beveled or straight ends.

Bethlehem Oil and Gas Pipe comes in all shippable diameters, starting with 22 in. We also produce standard lap-weld pipe in sizes up to 16 in.

Up to 36 in., Bethlehem Oil and Gas Pipe has one longitudinal and one girth seam. Larger sizes have two or three longitudinal seams, no girth seams.

Our shop is well equipped for automatic submerged-arc welding, grit-blasting, priming, enameling and wrapping.

We are also equipped to manufacture tees and crosses, plus a full range of special fittings.

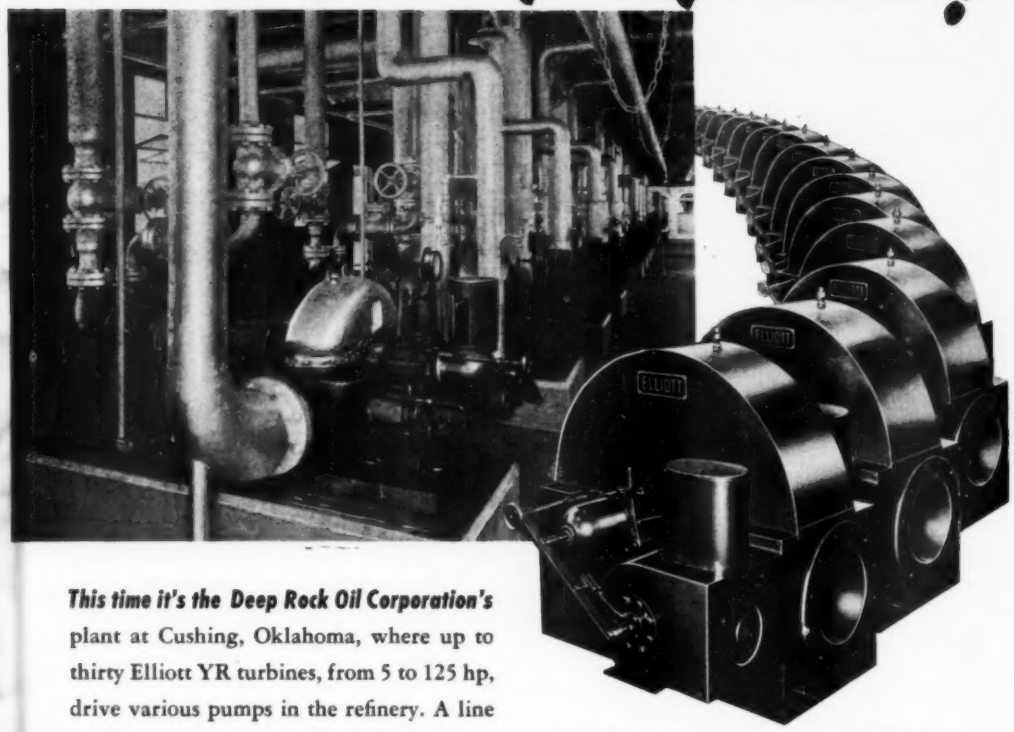
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM OIL AND GAS PIPE

BETHLEHEM STEEL

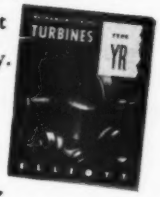
Again it's Elliott Turbines *for reliable pump drive!*



This time it's the Deep Rock Oil Corporation's plant at Cushing, Oklahoma, where up to thirty Elliott YR turbines, from 5 to 125 hp, drive various pumps in the refinery. A line of these units is shown in the photo above.

Low cost maintenance is well served by standardizing on these hardy turbines. With only five frame sizes for the entire capacity range, and with various governor and valve parts similar throughout, the inventory of replacement parts can be cut way down.

With the men whose job it is to keep things going Elliott turbines are pretty generally regarded as among the greatest worry-eliminators in the refinery. Bulletin H-16 tells why. Your request brings it.



HALF CENTURY OF POWER PROGRESS 1901 EC 1951

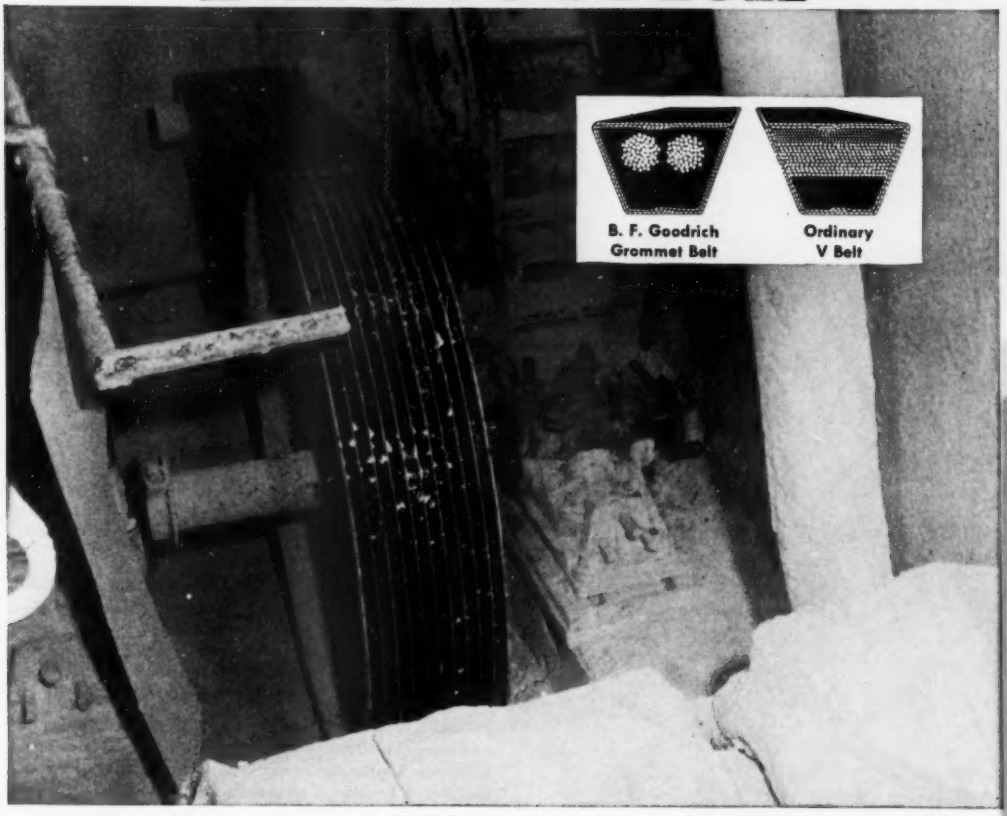
H-734

ELLIOTT COMPANY

STEAM TURBINE DEPT.
JEANNETTE, PA.

Plants at: JEANNETTE, PA. • RIDGWAY, PA.
AMPERE, N. J. • SPRINGFIELD, O. • NEWARK, N. J.
DISTRICT OFFICES IN PRINCIPAL CITIES

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Where a change to B. F. Goodrich grommet belts saved $100 a week

B. F. Goodrich grommet V belts cut costs 20 to 50%

WHAT would you do if you were spending $100 a week to replace failing V belts on one drive? That was the case in this mill — ordinary V belts failed in a week or less. They couldn't carry the terrific power load.

The company called in the BFG sales engineer and B.F.Goodrich grommet V belts were installed. That was 5 months ago and the grommet belts look as good today as the day they were installed. Here's why:

Endless — A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping cord sections. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless grommet belt eliminates such failures.

Concentrated cord strength — All of the cord material in a B. F. Goodrich grommet belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced.

Better grip, less slip — Because a grommet is endless, a grommet belt is more flexible, grips the pulleys better. Size for size, grommet belts will give ⅓ more gripping power, pull heavier loads with a higher safety factor.

Only B. F. Goodrich has the grommet! — No other multiple-V belt is a grommet belt (U. S. Patent No. 2,233,294). Now available in C, D and E sections. See your local B.F.Goodrich distributor. Ask him to show you his "X-ray" belt that illustrates grommet construction clearly. *The B.F.Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

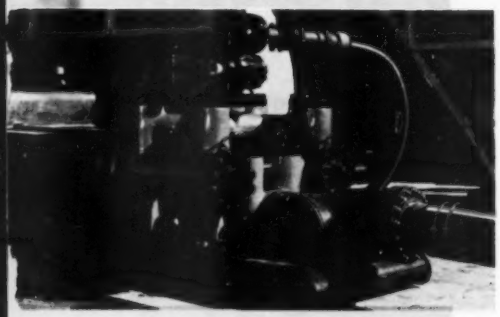
Grommet Belts BY

B.F.Goodrich

RUBBER FOR INDUSTRY

Get Thermoid Oilfield Products at your nearest "Oilwell" Store

Powerflex Pressure Seal Rotary Hose, with patented forged steel couplings, combines light weight with great strength.



Mud-Flo Suction and Flexible Discharge Hose cuts down on rig-up time and reduces vibration in the mud lines.

THERMOID HOSE is made by patented and exclusive construction methods for each type of oilfield service . . . and is designed with extraordinary strength to withstand the high-pressure and pulsation stresses that are peculiar to drilling applications. That's why "Oilwell" stocks and recommends Thermoid products.

THERMOID POWERFLEX ROTARY HOSE . . . is a rugged combination of high-tensile steel cable, heavy-duty fabric and oil-resistant synthetic rubber; bonded together to produce a tough, abrasion-resistant hose that is unrivaled for strength and flexibility. Full-flow steel couplings are securely anchored. Each length is proof tested to 5000 lbs.

THERMOID TRIOFLEX ROTARY HOSE . . . for slim-hole drilling, is reinforced with high-tensile steel wire braid. This hose is extremely flexible and resistant to kinking and coils in 36″ diameter. The tube is constructed of highest quality synthetic rubber, with a tough oil and grease-resistant cover that protects the inner sections from wear. Each length is proof tested to 2000 lbs.

THERMOID MUD-FLO SUCTION HOSE . . . is made with thick oil-resistant inner tube firmly bonded to strong cotton fabric. Heavy galvanized round wire reinforcement is embedded in rubber compound to absorb pumping vibrations and provide unobstructed flow.

THERMOID FLEXIBLE DISCHARGE HOSE . . . incorporates the same rugged construction features as Powerflex Rotary Hose and acts as a flexible high pressure connection between the mud pump and the standpipe. It eliminates many sharp-angle fittings and reduces turbulence and pressure loss.

OIL WELL SUPPLY COMPANY

Branches Serving All Oil Fields

Executive Office — DALLAS, TEXAS
Export Division Office —
30 ROCKEFELLER PLAZA
NEW YORK 20, N. Y.

Division Offices — CASPER, WYOMING
COLUMBUS, OHIO . . . DALLAS, TEXAS
HOUSTON, TEXAS . . . TULSA, OKLAHOMA
LOS ANGELES, CALIFORNIA

USS TRADE MARK

"OILWELL"

TRADE MARK

UNITED STATES STEEL

Why no grass grows under this mower maker's feet!

JACOBSEN LAWN QUEEN

Jacobsen Manufacturing Company, pioneer builder of power mowers, is located at Racine, Wisconsin, far from its affiliates — Worthington Mower Company, Stroudsburg, Pennsylvania, and Johnston Lawn Mower Corporation, Ottumwa, Iowa. In *time*, however, all three concerns are close. Each has a Beechcraft Bonanza. This means that Mr. O. T. Jacobsen, President, and officials of the affiliated companies can meet at Racine, return home with no time lost. Sales trips have more "sales" and less "trip." These Bonanzas are in the air almost daily, helping "expedite" government defense work and civilian production alike.

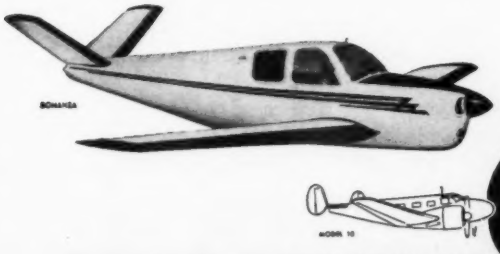
Compare these great C35 Bonanza features

Economy: When cruising, you use only 65% of available engine power. This results in longer engine life, lower operating and maintenance costs. Cruising-speed fuel consumption 9½ gallons per hour—a remarkable engineering achievement.

High performance: All-metal continuously variable pitch Beechcraft propeller has 85% efficiency — top range for its class. Take-off rating 205 h.p. at 2,600 rpm. Means even better short field performance, rate of climb of 1,100 fpm.

Unsurpassed safety: Now standard on C-35—Beechcraft Hi-Strength Safety Harness. New freedom of movement, unsurpassed protection. For added comfort, rear seat is two-position, with headrest. New fresh air intake increases ventilation.

For more news of this feature-packed business plane, contact your Beechcraft Distributor, or write Beech Aircraft Corporation, Wichita, Kansas, U.S.A.



Top speed, 190 mph
Cruising speed, 175 mph
Range, 775 miles
Fuel economy, 19.9 mpg

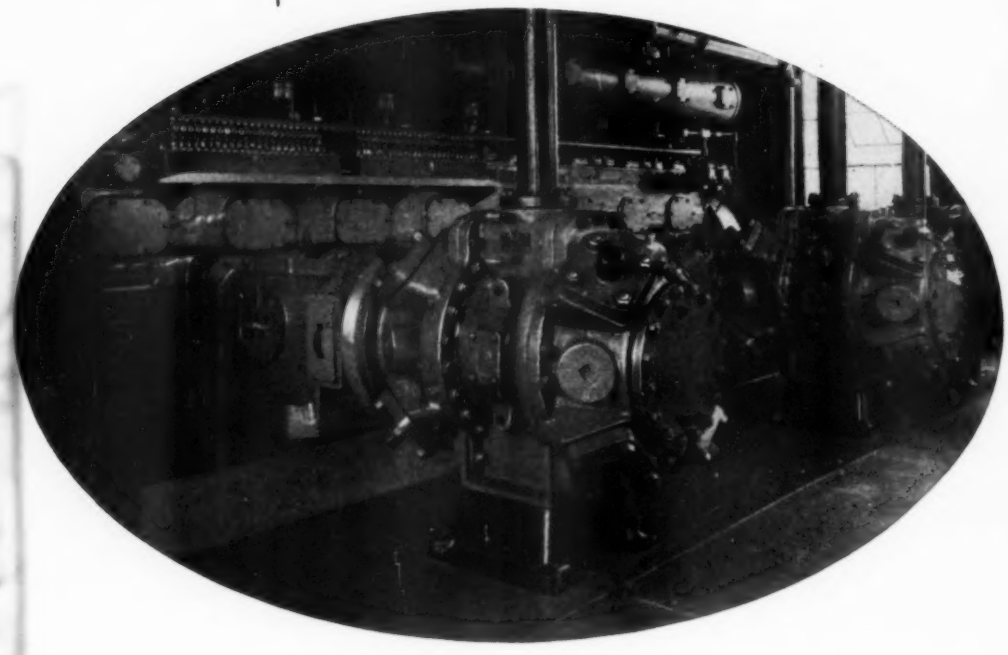
Beechcraft

BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

The Oil and Gas Journal, published Thursdays by The Petroleum Publishing Company. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $3 yearly. Copyright 1951.

Insure dependable performance of pipe-line compressor units, reduce maintenance costs

with **Gulf Security Oil**



You make a two-way savings when your pipe-line compressor units are lubricated with Gulf Security Oil—lower maintenance costs, less out-of-service time.

Gulf Security Oil provides outstanding protection for bearings and cylinder walls in both engines and compressors. After years of operation with this quality lubricant, equipment shows remarkable freedom from cylinder wear and a minimum of carbon deposits on valves and rings.

Because of its excellent resistance to oxidation, Gulf Security Oil stands up for many hundreds of hours without appreciable change in its original properties. And because oil control rings are kept clean, oil consumption is remarkably low.

Many operators of units lubricated with Gulf Security Oil report that this quality oil insures more operating hours between overhauls and helps them avoid unscheduled shutdowns. And Gulf's delivery service is tailored to meet the needs of every pipe-line operator.

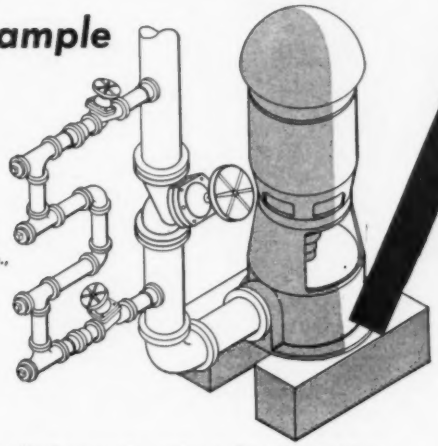
For complete information on Gulf Security Oil and for expert help on any lubrication problem, call in a Gulf Lubrication Engineer today. Write, wire, or phone your nearest Gulf office. Gulf Oil Corporation · Gulf Refining Company, Gulf Building, Pittsburgh 30, Pa.

FIFTY YEARS OF SERVICE
1901 GULF 1951
PETROLEUM AND ITS PRODUCTS

for outstanding service

on Corrosive Well Water

...for example



The Installation—
Barr Rubber Products Co.,
Sandusky, Ohio

PROBLEM: To eliminate costly seating and packing maintenance, and frequent replacement of valves on plant well-water pump. Valves previously used highly unsatisfactory, having maximum life of 6 months.

WORKING CONDITIONS: Sulphur content of water extremely high. Valve constantly exposed to severe corrosive and erosive effects. Operated infrequently; yet easy operation, positive seating are prime requisites.

SOLUTION TO PROBLEM: Crane Packless Iron Body Diaphragm Valves featuring separate disc and diaphragm design. Three-inch No. 1611 flanged end valve on main discharge; ¾-inch No. 1610 screwed end valves on by-pass.

RESULT: While other valves lasted only 6 months or less, Crane Diaphragm Valves show no effects of service, after more than a year. They operate smoothly . . . seat tightly . . . no maintenance whatsoever needed to date!

Another typical demonstration of superior quality, and the low-cost performance of Crane Valves. That's why . . . More CRANE VALVES are used than any other make!

...Choose Dependable CRANE VALVES

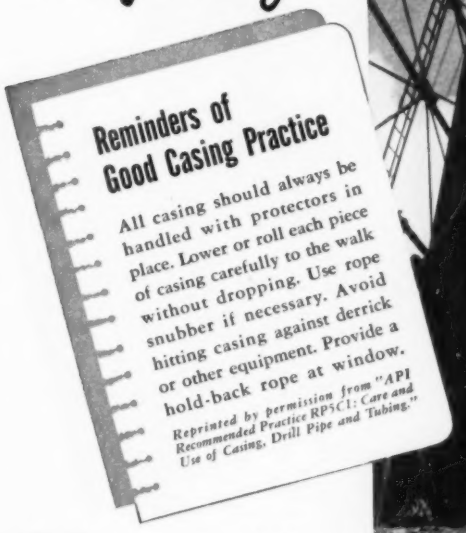
No. 1611 Crane Iron Body Diaphragm Valve —one of a full line suited for many services. Literature on request from your Crane Branch or Crane Wholesaler.

CRANE CO.

General Offices:
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

How to keep creases out of casing


Reminders of
Good Casing Practice
All casing should always be handled with protectors in place. Lower or roll each piece of casing carefully to the walk without dropping. Use rope snubber if necessary. Avoid hitting casing against derrick or other equipment. Provide a hold-back rope at window.
Reprinted by permission from "API Recommended Practice RP5C1: Care and Use of Casing, Drill Pipe and Tubing."

HOLD THE LINE AGAINST COLLAPSE
with Republic Electric Weld Casing

• Above ground, you can protect your valuable supplies of casing by following these simple, common-sense precautions. Below ground, trust the uniform strength, roundness, and wall thickness of Republic Electric Weld Casing for unwavering collapse resistance...all the way down.

Republic Electric Weld Casing is cold-formed from high ductility steel. It is fully normalized for uniform structure, and cold sized for dimensional accuracy and extra high yield strength. The weld tests fully as strong as the rest of the wall.

These are the qualities that combine with uniform roundness and uniform wall thickness to make Republic Casing tops for resistance to collapse. And, a uniform depth of tough steel under thread roots all around the pipe protects against pull-outs.

You can hold the line against both collapse and pull-out by specifying "Republic Electric Weld" on casing and tubing orders.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Dept.: Chrysler Building, New York 17, New York

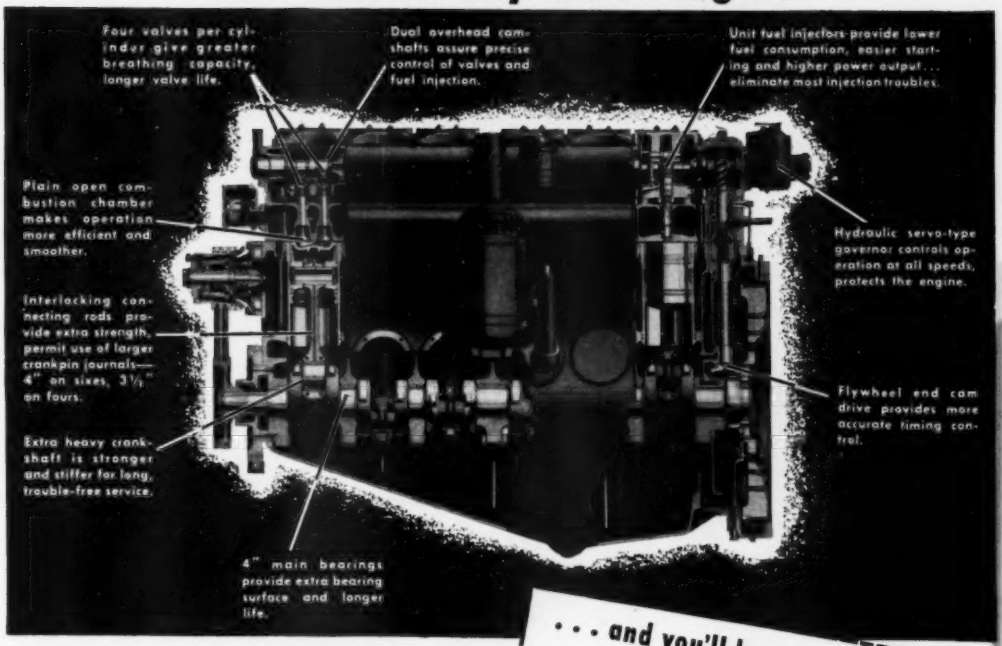
Republic Electric Weld Casing and Tubing are made from flat-rolled steel, both sides of which are inspected. Thus, the surface which becomes the inside wall is free from hidden defects.

REPUBLIC *Electric Weld* **NORMALIZED CASING AND TUBING**

Other Republic Products include Line Pipe—Carbon, Alloy and Stainless Steels—Upson Studs, Bolts and Nuts—Electrunite Heat Exchanger Tubes

Compa**MURPHY DIESEL**esign

with that of any other engine


Four valves per cylinder give greater breathing capacity, longer valve life.
Dual overhead camshafts assure precise control of valves and fuel injection.
Unit fuel injectors provide lower fuel consumption, easier starting and higher power output... eliminate most injection troubles.
Plain open combustion chamber makes operation more efficient and smoother.
Hydraulic servo-type governor controls operation at all speeds, protects the engine.
Interlocking connecting rods provide extra strength, permit use of larger crankpin journals—4" on sixes, 3½" on fours.
Flywheel end cam drive provides more accurate timing control.
Extra heavy crankshaft is stronger and stiffer for long, trouble-free service.
4" main bearings provide extra bearing surface and longer life.

. . . and you'll know why it gives you

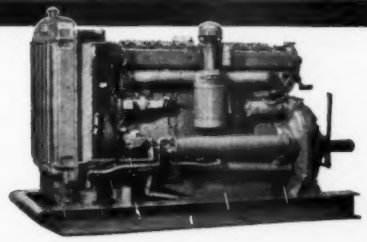
- **MORE POWER**
- **GREATER ECONOMY**
- **GREATER DEPENDABILITY**
- **LONGER LIFE**

MURPHY DIESEL

Heavy duty power

for the oilfields

Murphy Diesel Engines and Power Units for drilling and pipe line pumping, 90 to 226 H.P., 1200 and 1400 RPM. Generator Sets, 60 to 140 K.W. Dual-Fuel Engines, 135 to 180 H.P. Also Crude Oil Burning Engines.



ONLY with Murphy Diesel do you get all the advanced design features described above . . . and only with Murphy Diesel do you get all extra power, economy, dependability and engine life that this design assures. Proved in thousands of hours of the toughest kind of service, this design has resulted from skilled engineering and long practical experience.

A more detailed discussion of these features and others is given in the booklet, *"10 Questions to Ask a Diesel Engine Salesman."* You can get a copy from your Murphy Diesel Dealer or we'll be happy to send you one.

MURPHY DIESEL COMPANY

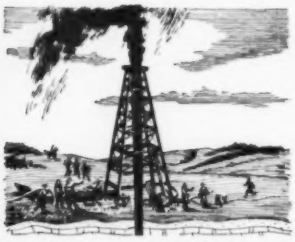
5065 W. Burnham St. Milwaukee 14, Wis.

Sales, parts and service in principal centers

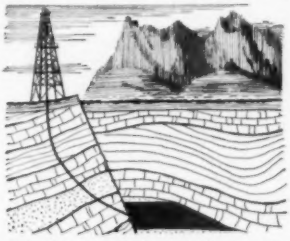
"What are you doing to save our oil resources?"

People are concerned these days *about America's supply of crude oil. They say, "If petroleum resources are beginning to run out, we ought to be careful to make them go as far as possible. What are you big companies doing to save our oil resources?"*

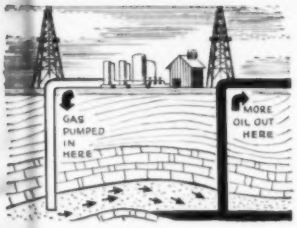
Here's the answer to that question. Known crude oil reserves are actually 30% greater today than in 1940. And in addition to making new discoveries, the oil industry—Standard Oil Company of California along with others—is making *each well* and *each barrel* of oil yield more and more. Competition makes us produce and refine *efficiently*. Here are some of the ways we do it:



Remember the gusher? Years ago new wells were allowed to erupt. But oil men found ways to stop this waste. And now they extract three new fuels from the gas mixture.



We also prevent waste by tapping oil pools which used to be out of reach. Through research into drilling techniques we make holes *curve*, to reach under mountains, for example.



Time was when only natural pressure lifted oil to the surface. Wells often "went flat." We now use huge systems to pump pressure back *in*, recovering much oil formerly lost.

Latest techniques help us in warring on waste. Standard uses a new "electronic brain" to compute best way to drill oil fields for greatest yield 25 years or more into the future.

Natural gas, a by-product of oil production, was once merely wasted. But oil companies long ago learned how to capture it, put this energy to work, and conserve oil resources.

And research in refining helps. In 1920, Western refineries were getting less than 7 gallons of gasoline from each barrel of crude. They now get 20 gallons of far better gas.

I'd Like to Know . . . You may have heard that a suit has been filed by the Antitrust Division in Washington in an effort to break up Standard of California as well as six other West Coast oil companies. Many people have written us protesting this action, and many have asked pertinent questions about our activities. We answer all letters individually, but some points seem of general interest. We take this way of discussing them for everyone. If you have a question, we urge you to write:

"I'd Like to Know"
225 Bush Street, San Francisco 20, California

STANDARD OIL COMPANY OF CALIFORNIA
• plans ahead to serve you better

250,000 TONS OF KAISER STEEL PIPE...

. . . are being delivered *on schedule* for the 1300-mile pipeline of the Trunkline Gas Supply Company. This important 26-inch line extends from Southwest Texas to Illinois.

On-time delivery is an important factor in the building of a vast pipeline system. Because of Kaiser Steel's performance for this line, its record for consistent dependability has been enhanced.

Add to this Kaiser Steel's unsurpassed quality, and it's easy to see why experienced linemen consistently rely on Kaiser Steel pipe.

Kaiser Steel pipe is manufactured to conform to latest API specifications—in diameters from ½ inch to 30 inches, and in lengths up to 55 feet. Shipping points are Fontana and Napa, Calif.

It's good business to do business with

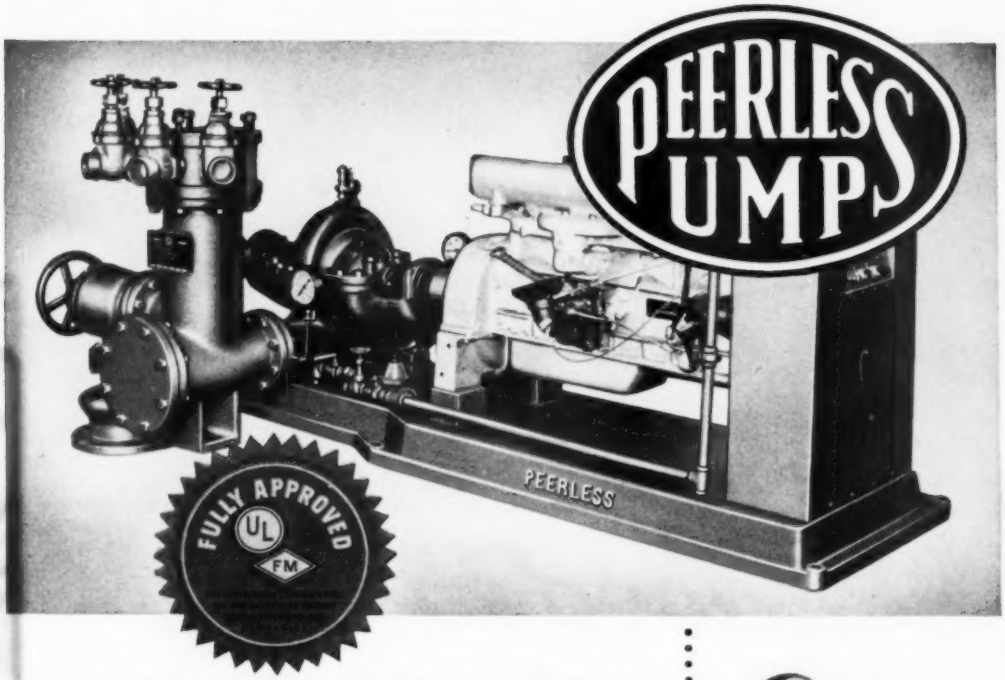
Kaiser Steel

KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, Calif.
Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	8⅝" to 20" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅝" to 12¾" O.D.	Up to 55'	.188" to .400"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	22" to 30" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser

Prompt, dependable delivery at competitive prices • KAISER STEEL CORPORATION Los Angeles, Oakland, Seattle, Portland, Houston, Tulsa, New York

FOR UNSURPASSED FIRE PROTECTION PUMPS LOOK TO THE LEADER—LOOK TO PEERLESS



PEERLESS UNDERWRITERS' APPROVED FIRE PUMPS (DAYTON-DOWD DESIGN)

HORIZONTAL CENTRIFUGAL AND VERTICAL TURBINE TYPES—Peerless Underwriters' Approved Fire Pumps can be applied to practically every commercial and industrial risk requiring fire protection. They afford dependable, low cost protection, peak quality performance and unquestioned reliability that often will result in measurable savings in insurance cost.

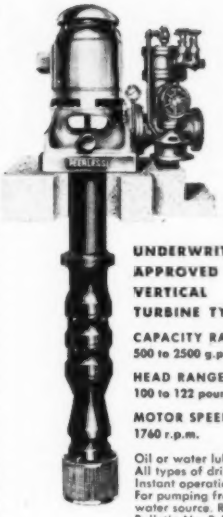
SINGLE AND MULTI-STAGE—Peerless Underwriters' Approved Fire Pumps are available in two types. The Type AF, shown above, is a single stage, double suction, horizontal centrifugal design, with a capacity range of from 500 to 2000 g.p.m., affording pressures, at rated capacities, from 40 to 150 lbs. and is available in 4", 5", 6" and 8" discharge sizes.

The Type TUF is a 2-stage pump available in 4", 5", 6" or 8" discharge sizes and furnishes from 500 to 1500 g.p.m., with a pressure range, at rated capacities, from 100 to 200 lbs.

ALL TYPES OF APPROVED DRIVES—Peerless approved fire pumps may be equipped with any type of drive: electric, steam turbine, gasoline or diesel engine. Auxiliary stand-by engine drives may be used in conjunction with turbine or motor drive to assure instant service even in the event of power failure.

SPRINKLER AND FOAM SYSTEMS—Peerless Underwriters' Approved Fire Pumps are ideal for application to liquid-foam type fire protection systems as well as to conventional sprinkler application; the former is especially desirable for solvent processing plant protection where the split-second control of fire hazards is a must.

NEW 24-PAGE BULLETIN ANSWERS ALL QUESTIONS ON UNDERWRITERS' FIRE PUMPS—Peerless Bulletin No. B-1500 completely describes and illustrates these unsurpassed and approved fire protection pumps. Write for your free copy today.



UNDERWRITERS' APPROVED VERTICAL TURBINE TYPES

CAPACITY RANGE: 500 to 2500 g.p.m.

HEAD RANGE: 100 to 122 pounds.

MOTOR SPEEDS: 1760 r.p.m.

Oil or water lubricated. All types of drives. Instant operation. For pumping from any water source. Request Bulletin No. B-152-1.

PEERLESS PUMP fmc

PEERLESS PUMP DIVISION

FOOD MACHINERY AND CHEMICAL CORPORATION

Address Inquiries to Factories at: Los Angeles 31, Calif. or Indianapolis 8, Indiana

Offices: New York, Atlanta, Fresno, Los Angeles, Chicago, St. Louis, Phoenix; Dallas, Plainview and Lubbock, Texas; Albuquerque, New Mexico

how to GET MORE WELDING from your PIPE WELDERS

The exceptional accuracy and uniformity of Midwest Welding Fittings enable the welder to spend more time in welding and less time in preparation. He does not have to struggle to line up fittings and pipe . . . all pipe can be cut in advance according to drawings . . . he need never compensate for inaccuracies. Time and money savings are substantial.

The dimensional accuracy and uniformity of Midwest Welding Elbows result from a unique method of manufacture. These elbows are first made slightly oversize . . . then reheated to forging temperature and brought to final size in *compression dies*. This assures true circular cross section, uniform wall thickness and accurate radius, included arc and tangents.

Midwest Welding Fittings save you money . . . there is a distributor near you . . . it will pay you to call him.

3718

MIDWEST
PIPING & SUPPLY COMPANY, Inc

MAIN OFFICES: 1450 SOUTH SECOND ST., ST. LOUIS, MO.
PLANTS: ST. LOUIS, PASSAIC (N.J.) and LOS ANGELES

MIDWEST WELDING FITTINGS
Improve Piping Designs and Reduce Costs

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STOP OIL WELL JOINT LEAKS

Use

SPANGSEAL TUBING

Leaky tubing joints cost you time and money . . . particularly with today's deeper drilling and attendant higher pressures. Our engineers developed SPANGSEAL Tubing specifically to stop joint leakage. Couplings were eliminated by using an integral type connection with standard API threads on male and female ends. Half as many threaded connections—half as many possible points of leakage.

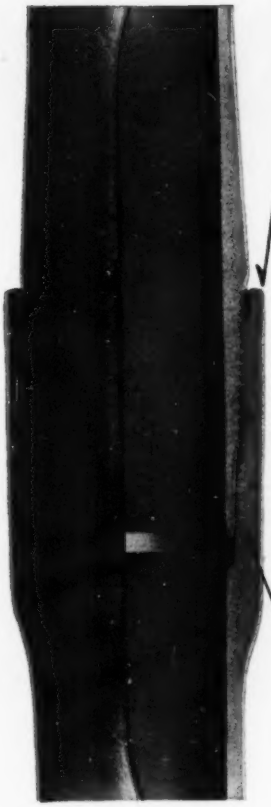
Then the engineers added a special feature to seal off pressure. They specified precision-machined mating conical sealing surfaces at the small end of threads of both members. THESE SEALING SURFACES BEAR THE PRESSURE, LEAVING THE THREADS TO FORM A MECHANICAL LOCK ONLY.

Result: Faster running time, more clearance, less chance of hanging up, and positive protection against joint leakage.

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT ★ SPANG STEEL PIPE ★

SPANGSEAL TUBING

features include . . .



INTEGRAL JOINT

Only two threaded elements. Use of couplings, requiring four threaded joints is eliminated. Female joint ends are treated chemically to provide anti-galling surface.

ECONOMICAL

SPANGSEAL Tubing saves you money. Costly repair jobs and remedial work due to leakage are eliminated.

ADDITIONAL CLEARANCE

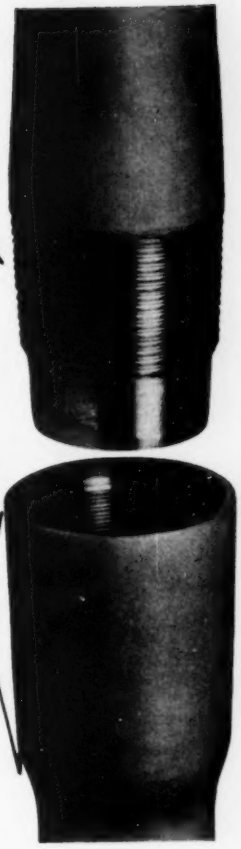
Extra clearance is obtained because the maximum OD of the SPANGSEAL Joint is smaller than the maximum OD of a coupling.

STREAMLINED EXTERIOR

The streamlined exterior contour of the female end reduces the chance of hanging up while running.

LEAK RESISTANT

Made up properly, threads serve only as a mechanical interlock. Conical sealing surfaces form a complete-circumferential seal.



For complete dependability, specify SPANGSEAL Tubing for your wells.

THE **NATIONAL SUPPLY** COMPANY

Spang-Chalfant Division—General Sales Offices: **Pittsburgh, Pa.**

Division Tubular Offices:

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SUPERIOR AND ATLAS ENGINES

NATIONAL BLUE PRODUCTS

SAVED $5000 A YEAR ON A SINGLE WELL ...ON MAINTENANCE COSTS ALONE!

PARKERSBURG *Air Balanced Pumpers*

● That's the kind of savings one major company made on a comparative test of a Parkersburg Air Balanced Pumper against conventional pumpers and gas lifts. Rod jobs which were averaging from 15 to 25 for conventional pumpers were eliminated . . . maintenance costs, both surface and subsurface, were reduced to zero, as compared to other types of pumping equipment which ran from $1875 to $4375.

Regardless of the type of fluid lifting equipment you are now using, you can save money by switching to Parkersburg Air Balanced Pumpers. They cost less to own . . . less to install.

Parkersburg Air Balanced Pumpers are designed to meet the highest standards of quality . . . the peak of efficiency in performance. They pay dividends in the form of savings throughout their many years of service. Ask your Parkersburg Representative for complete details.

No. 5113

PARKERSBURG

PUMPERS *Air Balanced • Chain Driven • Gear Driven*

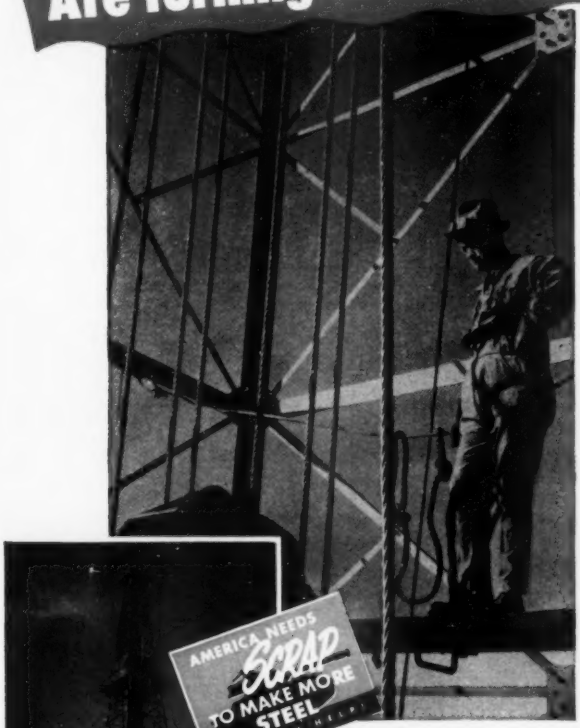
Manufactured in Coffeyville, Kansas

Drillers Who Know Their 3 C's

- COST of Replacement
- COST of Downtime
- COST of Operating

J&L STEEL

Are turning to J&L Wire Rope



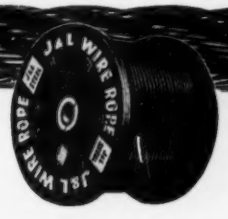
It doesn't take a wizard at mathematics to figure out that low operating costs mean economical operation and higher profits. That's why more and more smart drillers throughout the oil country are ordering J&L drilling lines for their rotary or cable tool rigs. Experience has proved that they'll get maximum service life—maximum hole per wire rope dollar with J&L.

The long service life of J&L Wire Rope is due to J&L's "quality controlled" method of manufacture. "Quality control" ensures the finest finished product by controlling every step in the manufacture of the wire rope from the mining of the ore to the final stranding and closing operations.

The result—long service life on the job, that's reflected on the balance sheet in low cost for wire rope, minimum downtime for rerigging and less man-hours spent installing new lines—in short, lower operating costs.

In addition, the popularity of J&L Wire Rope in the oil country is built on more than long service life. The men on the rigs like it too because it's easy to handle, spools smoothly, and is lubricated with J&L's exclusive Bronze-lube—the lubricant that's clean to handle, doesn't run out when the line gets warm.

If you're not already using J&L drilling lines, it will pay you to find out more about J&L quality controlled Wire Ropes. Why not contact your nearest J&L Wire Rope representative today?



JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L manufactures a full line of carbon steel products, as well as certain products in OTISCOLOY *and* JALLOY *(hi-tensile steels).*

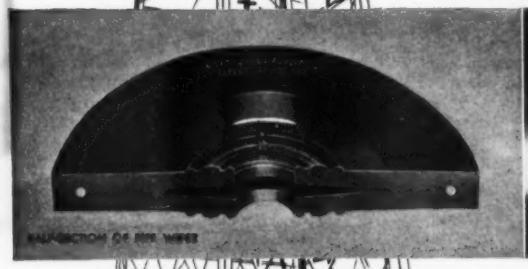
PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

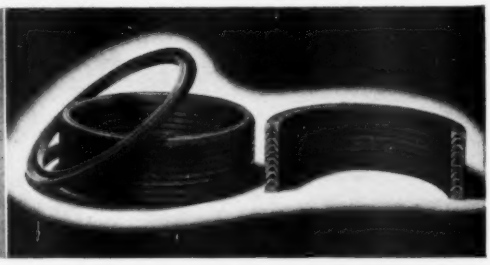
What's U. S. Rubber doing for your drilling dollars?

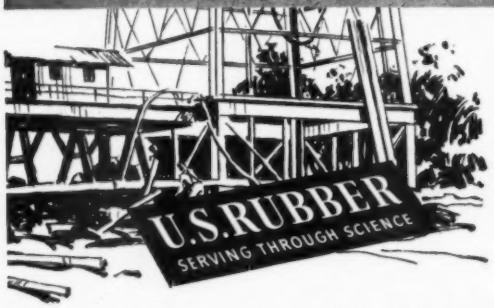
THIS NEW "U. S." PIPE PROTECTOR prevents wear on the casing or tool joint. Lowers vibration, friction and torque during drilling, resists cutting, abrasion, swelling and the effects of oil and acid. Knurling on the inside protects against seepage or slippage. Can be used with any kind of drilling mud.

NEW DOUBLE-LIP PIPE WIPER gives twice the wiping action of a single-lip wiper at single-lip cost. Does the work of two single-lip tandem wipers, and the field reports amazing service. Lips will stretch five times their size without damage.

MANY OF THE LARGEST makers of rotary drilling rigs select U. S. Matchless Packing (below) as original equipment. Its self-adjusting, automatic action reduces wear on rods and plungers at pressures as high as 8,000 lbs. psi.







These are just a few of the products "U. S." makes for the oil fields. They are weapons the driller uses in his constant battle against time, against shutdowns, against rising costs. "U. S." technicians, closely studying oil field requirements, are developing newer weapons all the time, backed by the most modern of physical and chemical laboratories and research units. Rely on United States Rubber Company products to save you drilling dollars.

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

WHAT COULD BE MORE ECONOMICAL?

than a Scotchman at a free lunch
OR a casing head that returns part of its original cost by saving valuable rig time

O-C-T "C-19" CASING HEADS HAVE SET A NEW *SAFETY STANDARD* for RIGS AND CREWS

Designed for quick setting and positive sealing, the O-C-T "C-19" Casing Head actually saves more than enough costly rig time to offset the slight additional first cost of this heavy-duty well control equipment. Besides, the O-C-T "C-19" gives **PRICELESS PREMIUM PROTECTION** against blowouts because the well is closed in around the casing and the seal applied automatically before blowout preventers are unflanged. Then, elevators are released to raise blowout preventers. What could be more economical? So, don't be "penny wise and pounds foolish" by throwing away your blowout protection at the last minute **FOR A MATTER OF HOURS** for the chance to save a few dollars in initial well head costs! Ask your O-C-T Representative or write for details on the "C-19" . . . the only deep well head that has been used on both the world's highest pressure AND the world's deepest wells.

Oil Center Tool Co.

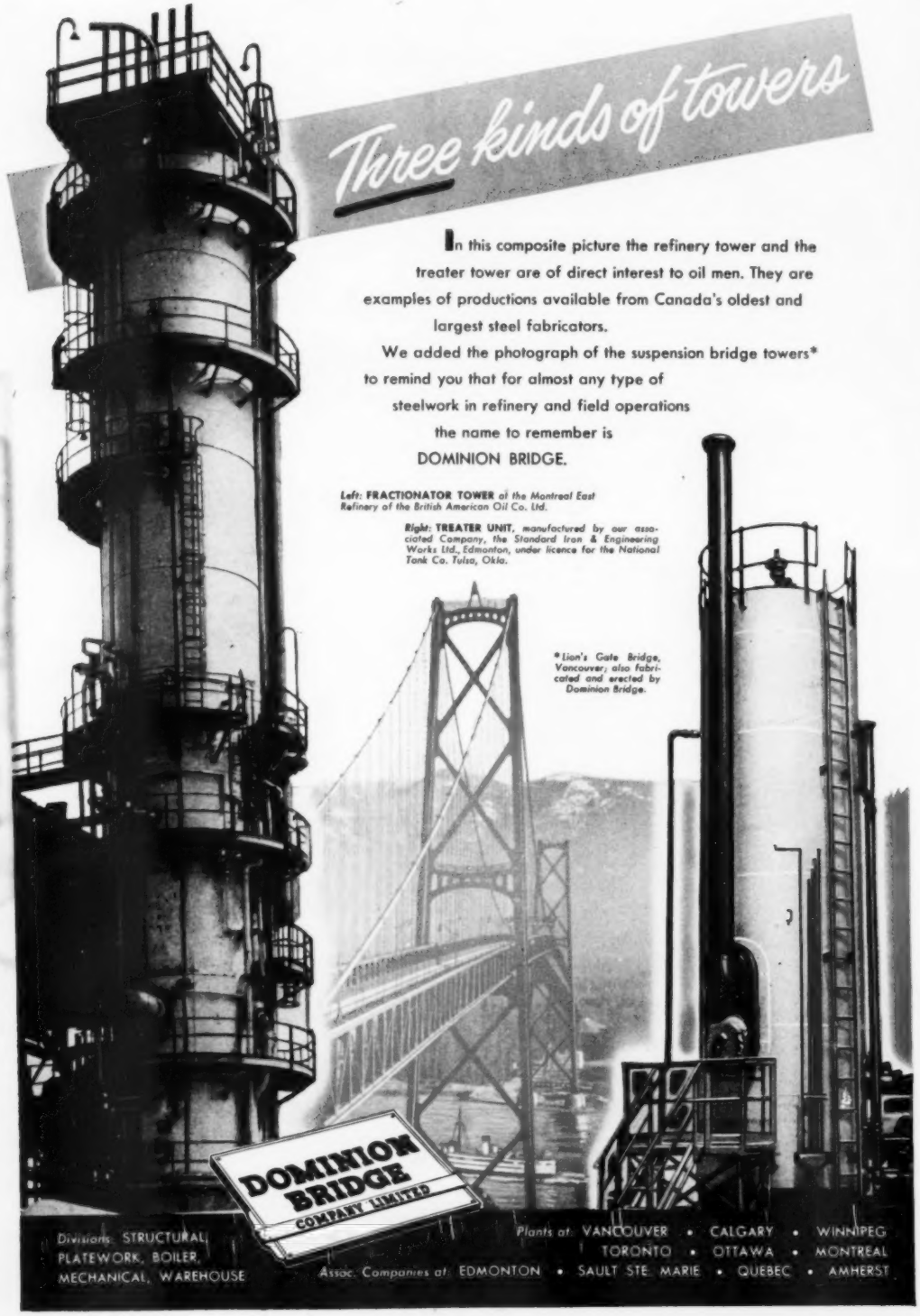
Three kinds of towers

In this composite picture the refinery tower and the treater tower are of direct interest to oil men. They are examples of productions available from Canada's oldest and largest steel fabricators.

We added the photograph of the suspension bridge towers* to remind you that for almost any type of steelwork in refinery and field operations the name to remember is DOMINION BRIDGE.

Left: **FRACTIONATOR TOWER** *at the Montreal East Refinery of the British American Oil Co. Ltd.*

Right: **TREATER UNIT**, *manufactured by our associated Company, the Standard Iron & Engineering Works Ltd., Edmonton, under licence for the National Tank Co. Tulsa, Okla.*



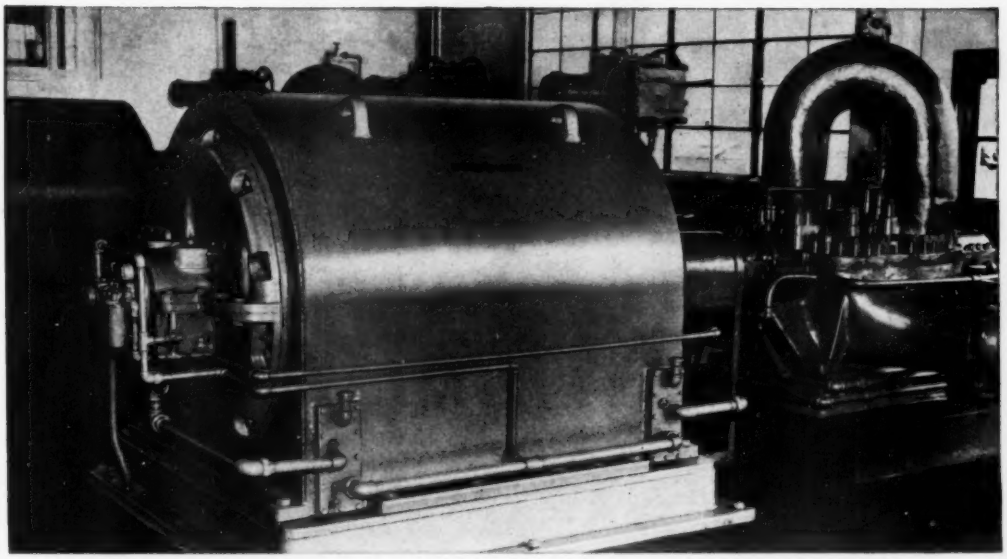
*Lion's Gate Bridge, Vancouver, also fabricated and erected by Dominion Bridge.

DOMINION BRIDGE COMPANY LIMITED

Divisions: STRUCTURAL, PLATEWORK, BOILER, MECHANICAL, WAREHOUSE

Plants at: VANCOUVER • CALGARY • WINNIPEG • TORONTO • OTTAWA • MONTREAL

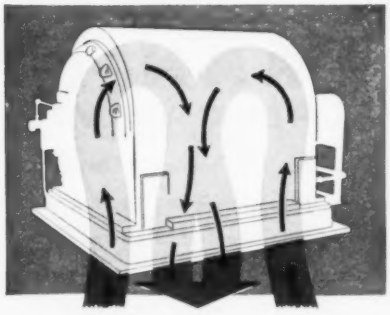
Assoc. Companies at: EDMONTON • SAULT STE. MARIE • QUEBEC • AMHERST



These two G-E forced base-ventilated motors—each rated 1500 hp, 2300 volts, 3600 rpm—drive centrifugal pumps in the Mayersville, Miss. station of the Mid-Valley Pipeline Company's 22-inch crude oil line. Two other stations in this 1000-mile line are similarly equipped.

All-enclosed cooling... all-around protection!

In new oil pipeline station, G-E motors require no extra equipment; separate motor-driven blowers remove motor heat, keep out hazardous gases



Simplified sketch shows how air inlet and outlet passages in motor's base all open directly down through the foundation to the source of ventilating air. By first starting a separate motor-driven blower, any hazardous gases are cleared from the main motor before latter is started.

Driving pipeline pumps that deliver 157,000 barrels per day, these two General Electric 1500-hp forced base-ventilated motors with separate motor-driven blowers combine both protective and low-cost advantages:

(1) Separate motor-driven blower—started up in advance—purges the main pump motor and duct system of any gases that may have accumulated during a shutdown period. It also removes heat quickly and effectively from the main motor during operation.

(2) Base ventilation—with both intake and discharge ducts located below floor level—does away with unsightly piping and the possibility of hazardous leaks through exposed pipe joints. In addition, a firewall between motor and pump is generally not needed, further reducing station construction costs.

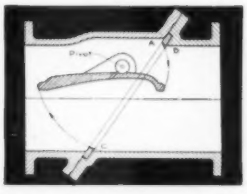
These motors are part of a broad G-E line for every electrified pipeline need. Let a G-E pipeline specialist help you select the right motors for *your* pipeline, and write for bulletin GEA-5423 on electrification of oil pipelines. *General Electric Co., Schenectady, N. Y.*

661-32

Everything you need to cut oil pipeline costs —ELECTRICALLY!

GENERAL ELECTRIC

YOU GET *Cushioned Closing* WITH CHAPMAN TILTING DISC CHECK VALVES



Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

There's no impact on closing — with this valve by Chapman. The balanced disc rides the flow smoothly — uses the fluid or gas itself to cushion the closing action. The disc lifts away from the seat easily on opening; closes quickly, positively—yet quietly.

Consequently, there's no rubbing on the seats—little wear on hinge pins and bearings. Repair needs are at a minimum — maintenance costs low.

Chapman Tilting Disc Check Valves are available in either iron or steel. Write today for catalog with complete technical information.

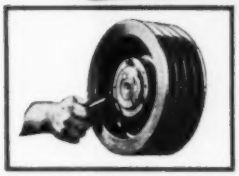
The Chapman Valve Manufacturing Company
INDIAN ORCHARD, MASSACHUSETTS

Everything You Need in V-Belt Drives!

TEXROPE

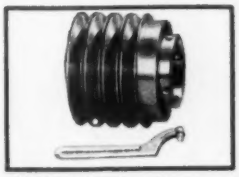
Greatest Name in V-Belt Drives

Made To Order Sheaves — These sheaves made with any number of grooves for A, B, C, D, or E belts, for applications up to 6000 hp. Allis-Chalmers own foundry and machine shops equipped to handle work of any size.

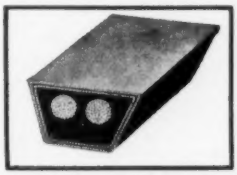


Magic-Grip Sheaves — Fastest mounting sheave you can buy. Aligns easily . . . cannot shake loose. 1 to 12 grooves for A-B, B, C, and D belts. 1 to 250 hp. Stocked in many cities for immediate delivery.

Non-Stock Sheaves—These sheaves are made to order from stock patterns for A, B, C, D, or E belts, 1 to 1000 hp. For further information check with your *Texrope* drive dealer or Allis-Chalmers Sales Office.



Vari-Pitch **Standard Sheaves** — Speed range of 9% to 28% on drives of 1 to 300 horsepower, using A, B, C, D, or E belts. Two to 10 grooves. These sheaves are available in either motion control or stationary control.



Texrope Super-7 **V-Belt**—Famous grommet construction. No splices where failure can start. Rubber cushion supports rayon cord at pitch line. Sizes and sections to suit all operating conditions. All Standard sizes from stock.

Get Expert Engineering Help

YOU CAN GET every V-belt drive component from the *Texrope* line: constant speed drives; standard and wide range *Vari-Pitch* drives; speed changers; motor bases; and new or replacement, long lasting *Super-7* V-belts.

In addition, you get extra engineering skill both in the field and factory that comes from having more industrial V-belt installations than any other manufacturer.

The world's greatest store of V-belt engineering knowledge has been condensed into a 120 page *Texrope* Pre-Engineered Drive Book. Covers 90% of all V-belt drive requirements. Ask your Allis-Chalmers Authorized Dealer or Sales Office for Bulletin 6956A, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3377

Texrope, Super-7, Vari-Pitch, and Magic-Grip are Allis-Chalmers trademarks.

Sold . . .
Applied . . .
Serviced . . .

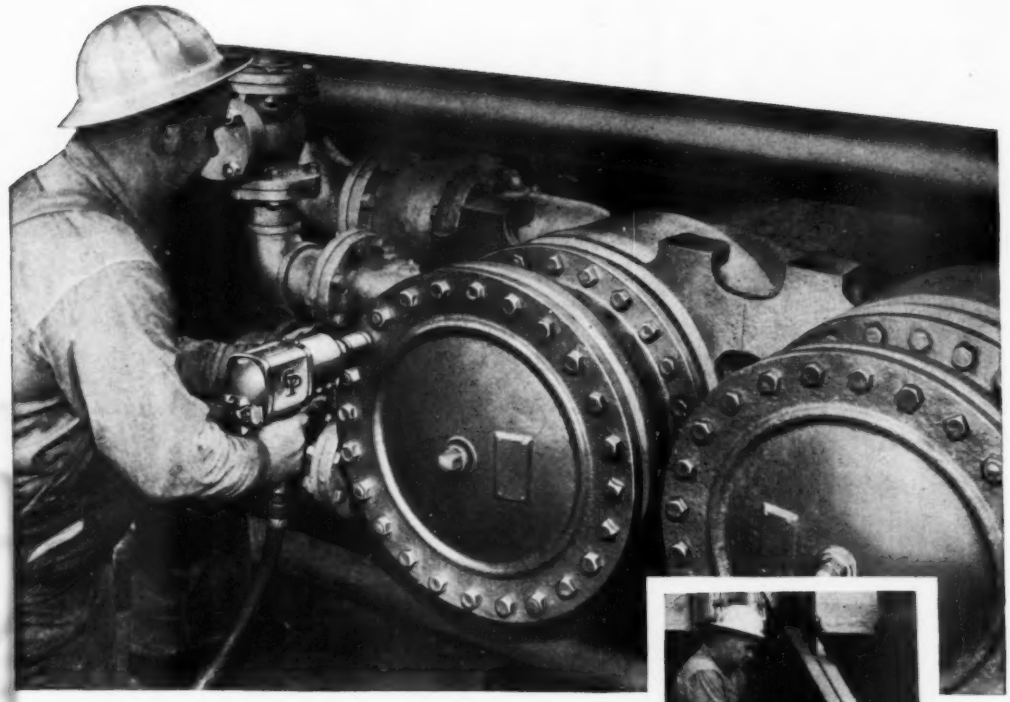
by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

ALLIS-CHALMERS



time-savers

on refinery and pipeline jobs

Speed erection jobs, reduce downtime, cut costs in pipeline work — by using CP reversible AIR IMPACT WRENCHES.

Powerful, compact, perfectly balanced, and with no twisting thrust to fatigue the operator, CP wrenches keep work on schedule.

Capacities range from ¼" to 1¾" bolt size, and angle head models are available to reach awkwardly located nuts, bolts and studs.

CAPACITIES—BOLT SIZE

CP-337	¼"
CP-334	⅜"
CP-3440	⅜", heavy duty
CP-349	½"
CP-360	¾"
CP-3630	¾", heavy duty
CP-365	1¼"
CP-375	1¾"

Write for a copy of Bulletin 812

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

They Say—

Time to Begin

"The study of pressure maintenace should start with first production and should consist of preventive medicine rather than a cure after the disease has destroyed the patient."

Roland V. Rodman, president, Anderson-Prichard Oil Corp. and Col-Tex Refining Co., Oklahoma City.

Gobbling the Gas Supply

"Gas is a major resource of the Southwest. Handled with discretion it can continue as a valuable resource for many years to come. As a fuel its greatest service is in home heating. Considered as a national resource it is the foundation for a growing chemical industry.

"The draining away to huge industrial centers is reducing gas to lowest value—as a boiler fuel substituting for virtually inexhaustible coal. . . . Huge industries are the principal reason for the vast expansion and there is no limit to the demand. The limit is the supply of gas.

"If this wild raid on the gas fields continues to expand there will be nothing but shortages and more shortages on the long-distance lines. The confusion will continue until the price soars and by that time the vast resources of the Southwest will be hopelessly depleted.

"The big question of policy will come when steel is available. The problem will check to the federal Government and the gas-producing states. They will have to face the basic fact: there isn't enough gas to supply the whole United States."

Editorial in the Kansas City Star.

Spraberry Confidence

"Sohio, with some 40,000 acres under lease, is one of the principal companies operating in the Spraberry trend. We have 27 rotary rigs running and 6 cable-tool rigs. Five wells have been completed and four are being completed.

"Sohio's interest and belief in the area are indicated by the fact that although we have only 3 per cent of the acreage we are running some 22 per cent of the tools. The importance of the Spraberry trend to Sohio can hardly be overestimated."

Sohio Production News, Sohio Petroleum Co.

Start Getting Ready!

Sir:

The Oil and Gas Journal is more than a trade paper. It is a living history of the American oil industry and the men who made it. To have maintained the high standards of reporting over a half-century is truly a remarkable accomplishment. In fact, it is the only really authoritative history.

Eight years from now the American oil industry will celebrate its Petroleum Centennial, the 100th anniversary of the Drake well, presumably on August 27, 1959. (The actual date of completion is unknown. I am inclined to favor August 20, rather than the 27th.)

I would like to see the Journal start getting ready now for that event. Your Golden Anniversary Number is clear proof that the Journal will be best qualified to do the reporting job on the first century of oil in the United States.

E. B. Swanson,
Department of the Interior,
Oil and Gas Division,
Washington, D. C.

No Need for Rationing

"Several top federal officials have stated more than once that there is nothing on the horizon to indicate gasoline rationing.

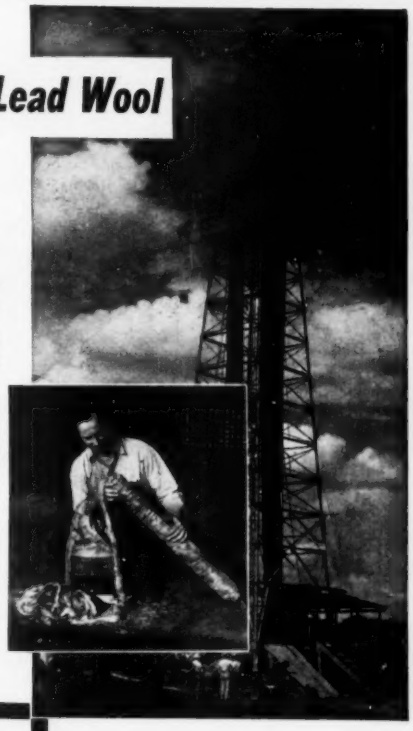
"But, the secretary of interior insists that there will have to be gas rationing if the Defense Production Administration does not allocate more steel for oil pipe lines. He considers gasoline rationing possibilities as ab-

Eagle-Picher Lead Wool

STOPS

bottom water

Rule out the risk of oil-wasting bottom water shutdown by tamping Eagle-Picher Lead Wool in the hole. The finely stranded, flexible metallic wool makes a water-tight plug that seals every crack and crevice. Comes in convenient 50-pound sacks—easy to place in special cartridge-shaped Eagle-Picher Wire Containers sized to fit all casings. Order through your jobber.



THE EAGLE-PICHER SALES COMPANY

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General Office, Box 777
East Chicago, Indiana

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Member: Lead Industries Association

EAGLE EP PICHER

These 3 Eagle-Picher Bearing Metals meet most requirements

1. **Dreadnaught**
   — for extreme speed and heavy-duty conditions.
2. **Outlasta**
   — for medium speed and average-load conditions.
3. **Durable**
   — for low speed and light-duty conditions.

solutely nil if steel for pipe lines in the quantity he wants is made available.

"A State Department official says there will have to be gasoline rationing if the British-Iranian oil dispute is not settled soon. The United States, he says, will have to send so much oil to Britain that rationing will be needed here.

"Each of these gentlemen has a personal whistle to blow and is using gas rationing to try to provide wind to make louder notes. It is about time for top federal officials to quit using the threat of gas rationing as a blackjack to try to put over some personal pet project, or to influence public opinion one way or another. Certainly the public must be sick of it."

Editorial in the Shreveport Journal.

What the Oil Industry Needs

"It is now necessary for the industry to again greatly expand its production capabilities. This will cost at least $3,000,000,000—considerably more than the industry's total profits in its best year. The industry will do all in its power to carry out this program.

"The best way to assure an adequate oil supply in the future is to keep this great industry free of governmental red tape and unnecessary controls, to maintain intelligent tax policies, and, above all, to keep oil going as one of the most highly competitive of businesses. That, in broad terms, is the road to progress in our kind of economy."

Editorial in the Oil City Derrick.

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CALENDAR

August

Society of Automotive Engineers, Inc., West Coast meeting, Olympic Hotel, Seattle, August 13-15.

Western Petroleum Refiners Association, regional meeting, Leonard Refineries Auditorium, Alma, Mich., August 17.

American Institute of Electrical Engineers, Pacific general meeting, Multnomah Hotel, Portland, Ore., August 20-23.

Eleventh Annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va., August 27-29.

September

American Chemical Society, 120th national Diamond Jubilee meeting, Hotel Statler, New York City, September 3-7.

Pacific Coast Gas Association, annual convention, Fairmont Hotel, San Francisco, September 4-6.

Michigan Petroleum Association, annual fall convention, Ramona Park Hotel, Harbor Springs, Mich., September 6-7.

International Union of Pure and Applied Chemistry, sixteenth conference, Hotel Statler, New York City, September 8-9.

New York Oil Heating Association, Inc., Hotel Statler, New York City, September 10.

International Congress of Pure and Applied Chemistry, twelfth conference, Hotel Statler, New York City, September 10-13.

Instrument Society of America, Coliseum, Houston, September 10-14.

American Society of Mechanical Engineers, Industrial Instrument and Regulators division, Coliseum, Houston, September 10-14.

National Petroleum Association, Hotel Traymore, Atlantic City, September 12-14.

International Union of Pure and Applied Chemistry, sixteenth conference, Hotel Statler, Washington, D. C., September 14-15.

American Institute of Chemical Engineers, national meeting, Sheraton Hotel, Rochester, N. Y., September 17-19.

Western Petroleum Refiners Association, regional meeting, Hotel Henning, Casper, Wyo., September 20-21.

American Association of Oilwell Drilling Contractors, eleventh annual meeting, Texas Hotel, Fort Worth, September 24-25.

American Society of Mechanical Engineers, sixth petroleum mechanical-engineering conference, Mayo Hotel, Tulsa, September 24-26.

American Society of Mechanical Engineers, fall meeting, Radisson Hotel, Minneapolis, September 25-28.

October

American Institute of Mining and Metallurgical Engineers, petroleum branch, fall meeting, Oklahoma City, October 3-5.

California Natural Gasoline Association, twenty-sixth annual fall meeting, Ambassador Hotel, Los Angeles, October 4-5.

Texas Mid-Continent Oil and Gas Association, annual meeting, Hotel Beaumont, Beaumont, Tex., October 8-9.

American Oil Chemists' Society, fall meeting, Edgewater Beach Hotel, Chicago, October 8-10.

National Safety Council, thirty-ninth national safety congress and exposition, Stevens Hotel, Chicago, October 8-12.

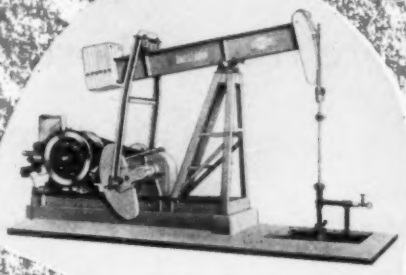
Indiana Independent Petroleum Association, fall convention, Hotel Severin, Indianapolis, October 13-14.

Oil Progress Week, October 14-20.

American Petroleum Credit Association, twenty-seventh annual conference, Adolphus Hotel, Dallas, October 15-17.

American Gas Association, annual con-

Protect Yourself...



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"That's why we are asking you to strain every effort to get more scrap out of your plants and yards and on its way to the mills . . . to search out the scrap that doesn't come to market in normal times. You'll find this "dormant" scrap in obsolete equipment, tools and machinery that you haven't used for years . . . overlooked in your storage sheds . . . or rusting away in a junk pile in some forgotten corner. It's there. Turn it in at once—*so we can turn out the steel you need.* We can't do it without your help."

B F Fairless

President, United States Steel Corporation

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UNITED STATES STEEL

vention, Kiel Auditorium, St. Louis, October 15-17.

National Metal Congress and Exposition, American Society for Metals, American Welding Society, American Institute of Mining and Metallurgical Engineers, and Society for Non-Destructive Testing, Hotels Statler, Book-Cadillac, and Detroit-Leland, Detroit, October 15-19.

Institute of Gas Technology, annual meeting, Chicago, October 18.

National Association of Corrosion Engineers, South Central Region, annual meeting, Corpus Christi, Tex., October 18-20.

American Association of Petroleum Geologists, regional meeting, Commodore Perry Hotel, Austin, Tex., October 18-20.

Independent Petroleum Association of America, Shamrock Hotel, Houston, October 21-23.

American Institute of Electrical Engineers fall general meeting, Hotel Cleveland, Cleveland, October 22-26.

Society of Exploration Geophysicists, eastern regional meeting, Webster Hall Hotel, Pittsburgh, October 25.

Society of Automotive Engineers, diesel-engine division, Drake Hotel, Chicago, October 29-30.

Society of Automotive Engineers, fuels and lubricants division, Drake Hotel, Chicago, October 31-November 1.

November

Louisiana-Arkansas Division, Mid-Continent Oil and Gas Association, twenty-ninth annual meeting, Roosevelt Hotel, New Orleans, November 1-2.

American Association of Petroleum Geologists, Pacific section annual fall meeting, Ambassador Hotel, Los Angeles, November 1-2.

American Petroleum Institute, thirty-first annual meeting, Stevens Hotel and Palmer House, Chicago, November 5-8.

Gulf Coast Association of Geological Societies, first annual meeting, Roosevelt Hotel, New Orleans, November 15-17.

Rocky Mountain Oil and Gas Association, annual meeting, Cosmopolitan Hotel, Denver, November 15-17.

Society of Exploration Geophysicists, regional meeting, Baker Hotel, Dallas, November 19-20.

American Society of Mechanical Engineers, annual meeting, Chalfonte-Haddon Hall, Atlantic City, November 25-30.

Twenty-third Exposition of Chemical Industries, Grand Central Palace, New York City, November 26-December 1.

December

American Institute of Chemical Engineers, annual meeting, Chalfonte-Haddon Hall, Atlantic City, December 2-5.

Chemical Specialties Manufacturers Association, thirty-eighth annual meeting, Mayflower Hotel, Washington, D. C., December 3-4.

New York Oil Heating Association, Inc., Hotel Statler, New York City, December 10.

NOMADS

Tulsa Nomads, third Friday of each month. After Five Room, Tulsa Hotel.

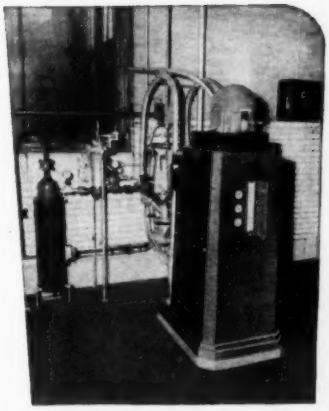
Dallas - Fort Worth Nomads, first Monday of each month, Greater Dallas Club.

Houston Nomads, second Monday of each month, Ye Ole College Inn, Houston.

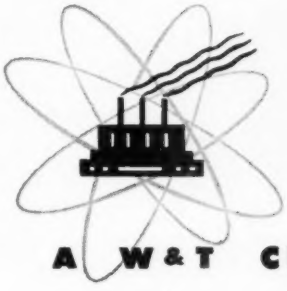
Los Angeles Nomads, second Wednesday of each month, Jonathan Club.

New York Nomads: September 11, luncheon, Downtown Athletic Club; September 18, golf party, Knoll Golf Club, Boonton, N. J.; October 1 and October 29, regular meetings, Louis Sherry's; December 8, Christmas dinner dance, Hotel Pierre.

SAXTON'S SECRET WEAPON . . .



W&T Chlorinator Installation at Saxton Station



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In winning their battle against condenser slime at the Saxton Generating Station, Pennsylvania Electric Company, in their company publication, called the Wallace & Tiernan Chlorinator their "Secret Weapon."

Here's what happened before chlorine was tried. Experience showed even a small accumulation of slime caused a one inch loss in condenser vacuum — equivalent to a five to ten per cent reduction in plant efficiency. Frequent mechanical cleaning — expensive and disagreeable — still left a thin layer of slime. Cleaning compounds involving acids and alkalis were found an unsatisfactory answer to the problem.

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As a result of these tests, a Wallace & Tiernan Automatic Chlorinator was installed at Saxton in May 1949. This precision chlorinator made possible reduced coal consumption and virtual elimination of mechanical tube cleaning — the reasons why a W&T Chlorinator is Saxton's "Secret Weapon."

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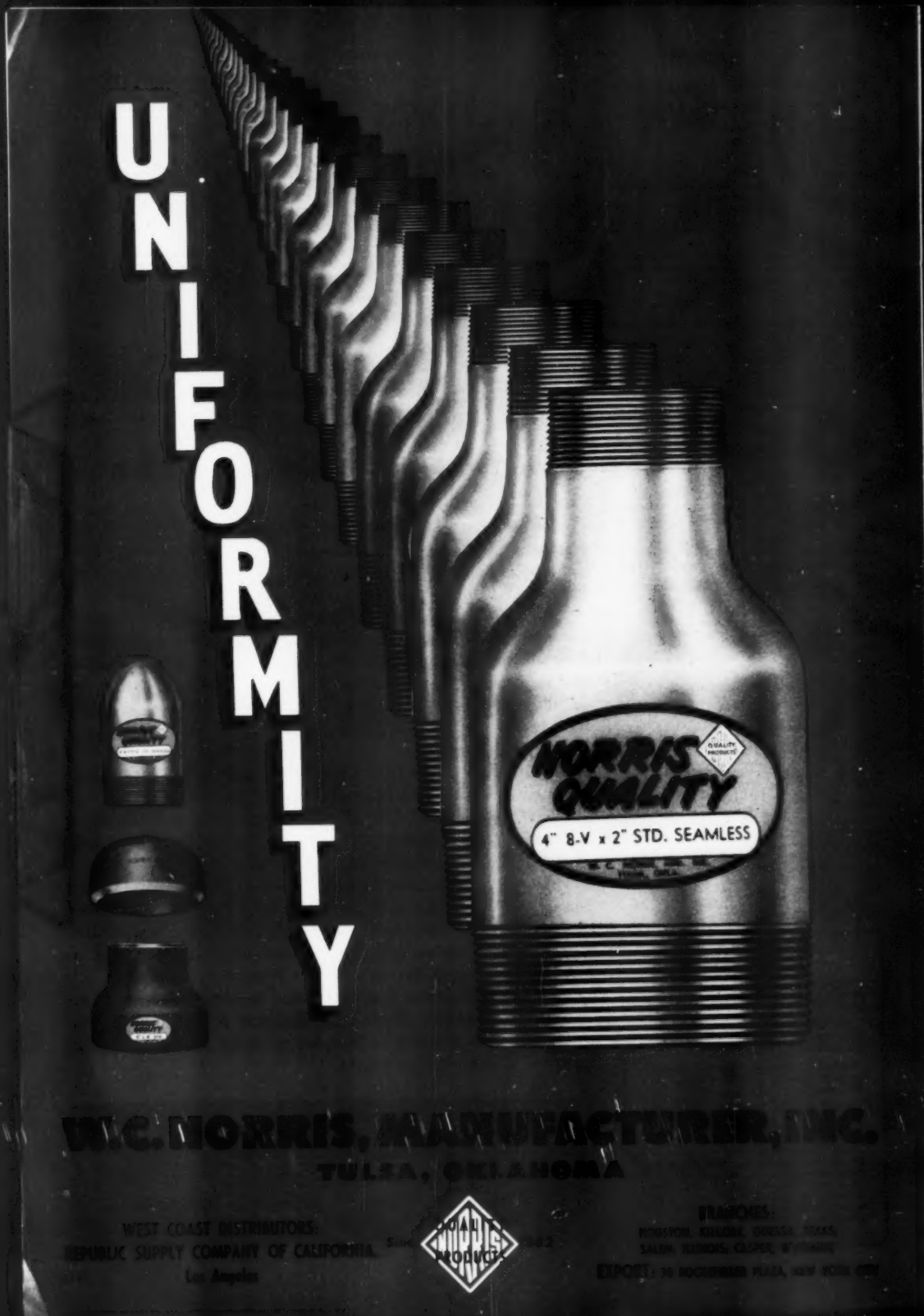

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Published every Thursday by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa, Oklahoma. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

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Subscription rate to the petroleum industry, United States and foreign, 1 year, $3.00. Single copies, 50 cents. Back copies when over a year old, one dollar. Note: Payments from outside the U.S.A. may be in the form of an international money order or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1951 by The Petroleum Publishing Co.

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JOURNALLY Speaking

Gas-Anchor Mice

ONE big trouble with taking a vacation is that you never can tell what your office colleagues will do to you during your absence. We know one fellow who returned to find his desk moved out and his personal belongings packed in a shipping box, and he nearly had heart failure until the boss convinced him it was all a joke and he wasn't really fired.

Something just as bad happened to us. While we were gone a letter came in, addressed to us personally and obviously intended for this department. But our mail was unscrupulously rifled by Ted Armstrong, an ex-Marine well versed in scrounging tactics, who stoops at nothing to purloin quotable quotes for the "They Say" department which regularly appears a couple of pages to the west of ours.

This letter was printed in the issue of June 28, page 33, and it presents a serious problem in oil production—the occurrence of mice in the gas anchor at the bottom of a pumping well. But as if stealing our material weren't enough, the rascally Armstrong added insult to injury by describing us as the detective editor and promising that we would clear up the mystery immediately upon our return.

This is a challenge which may not be lightly sloughed off. It's not just that our reputation is at stake, but the presence of mice in producing wells threatens to gnaw at the very vitals of the industry. So for several weeks now we have devoted our undivided attention to the matter and as a result of extensive research we present the following serious treatise:

The American field mouse *(Mus peromyscus)* has been widely observed throughout the oil-producing regions, usually on the surface or at depths seldom exceeding 12 in. It constitutes a serious hazard to oil production by eating p u m p e r s' lunches and making nests out of division orders. Its presence in the bottom-hole mechanism of pumping wells is a recent occurrence but is not surprising in view of the migratory, burrowing, and predatory habits of this destructive rodent.

Research into the problem of gas-anchor mice was approached by consideration of several hypotheses: (1) Indigenous occurrence. Search of the literature on anerobic rodents fails to support the supposition that mice normally inhabit the producing formation. (2) Overperforation. The possibility that the well was so perforated as to resemble Swiss cheese and thus attract mice could not be fully investigated in the absence of complete well-log and porosity data. (3) Entrapment: The possibility that the pumper dropped part of his lunch down the annulus and the mouse ran down to get it was ruled out by the affidavit of the pumper that he always eats in the shade of the pump house and never eats cheese sandwiches anyway. (4) Improper completion practices. The most probable hypothesis is that the mice were introduced into the well during completion due to the fact that the mouse hole was too far away from the catline.

Remedy. It is recommended that mice be removed from the gas anchor by installing a gas trap baited with mature limburger cheese which so closely resembles gas in odor that it might fool even a mouse.

References

"Mice in Gas Anchors," The Oil and Gas Journal, February 30, 1951.
"Lice in Grass Anchors," Institute of Oceanography, Republic of Outer Mongolia, 1859 (out of print).
"Bats in the Belfry," Batson D. Belfrey, Proceedings of the Royal Academy of Rodent Research, Tibet, XXXIV.
"My Friend, the Mouse," Tom Katz, Katzendogs Press.
"Three Blind Mice," Mother Goose.

On second thought, maybe the mouse got in after the gas anchor was brought to the surface.

Good Foundation

THE cornerstone of the new office building just completed in Houston by Transcontinental Gas Pipe Line Corp. contains copies of our favorite oil publication, gratifying recognition that the Big Yellow Book is the cornerstone of the industry.

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—Henry D. Ralph

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August 2, 1951

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When Disaster Strikes

When disaster strikes, the true mettle of a man or an industry is revealed. Twice in the last month disaster struck the petroleum industry.

On a hot Saturday afternoon the huge propane-storage terminal of Warren Petroleum Corp. at Newark, N. J., suddenly burst into flame and more than half of the big tanks exploded in the most spectacular holocaust in the city's history. As the first bulletins on the disaster began appearing in newspapers throughout the country that afternoon, Warren offices were flooded with calls from competitors as far away as California, offering help.

Technicians of these other companies were summoned from their homes and ordered to catch the first plane to Newark to help in fighting the fire and in determining its cause. Others were instructed to divert tank cars of propane from other destinations to Newark. Offers of propane supplies, tank cars, and the loan of storage space in the Newark area poured in.

Before the fire was under control Warren was able to assure its customers that not one of them would suffer from even a temporary shortage of propane despite the loss of the heart of its eastern distribution system. And at the same time a committee of the industry's top safety experts was meeting with state and federal authorities to investigate the cause and prevent a recurrence.

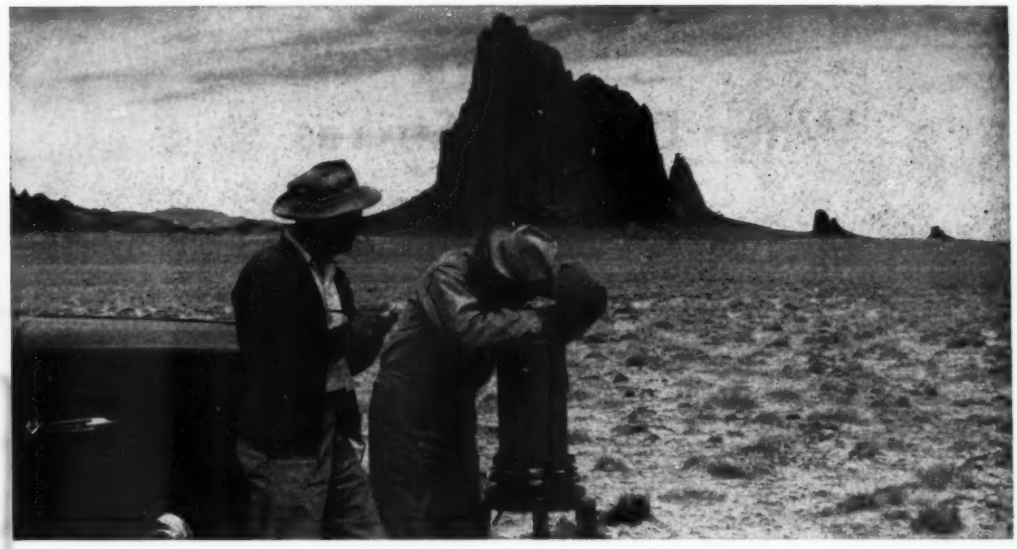
Then in Kansas the Kaw River went on a rampage and loosed unprecedented devastation on Kansas City and other communities. Along with many others, the petroleum industry suffered heavily in the flood. Pipe-line terminals, bulk stations, refineries, and tank cars were destroyed or put out of operation for many days, and transportation was disrupted.

Again the entire industry rallied to the support of its stricken members. A voluntary pooling of supplies, equipment, and manpower was put into effect immediately, on the spot and without red tape or formality. Those who had supplies of products, tank cars, and trucks shared them with those who were flooded out, to the end that the consuming public be supplied if humanly possible.

This week a score of flooded cities are cleaning up their debris and beginning to rebuild destroyed homes and industries. In this work they are short of many things, but not of petroleum products, thanks to the cooperative spirit and fast work of the oil industry. Federal funds are being dispensed for relief and reconstruction, but the oil industry is not seeking a dollar of this money. A believer in the risks of free enterprise, it will swallow its losses and rebuild with its own resources.

In normal times competition among oil companies is keen, but when disaster strikes it is tempered with a spirit of live and let live, of mutual assistance, and of service to the public above all else. That is the American concept of competition in action.

THIS WEEK



ROUGH SAILING.—Unimpressed by the geological anomaly of New Mexico's famous Ship Rock, this gravity-meter crew of Humble Oil & Refining Co. is charting subsurface anomalies in the unpredictable San Juan basin. Latest surprise in this vast Mecca for wildcatters is the Doswell-Pettigrew 2 Scott-Federal (The Oil and Gas Journal, July 12, page 133), completed in the previously ignored Tocito sandstone, which this week began producing 250 bbl. per day.

EXPLORATION—Carter Oil Co. to spend $8,000,000 in intensive drilling, exploration program in Uinta basin. . . . Stanolind, Continental, and The California Co. also stepping up drilling activity. . . . ¶Shell deepening 1 Northern Pacific wildcat to determine extent of oil-bearing formation after inconclusive production tests. . . . ¶Amerada completes 1 Clarence Iverson as first significant Williston basin producer. . . . Well completed in 10,490-10,530-ft. zone after acidizing for flow of 12 bbl. 39°-gravity oil per hour plus 290,000 cu. ft. gas. . . .

INDUSTRY—NPC committee forecasts continuation of upward trend in petroleum availability throughout the world through 1955. . . . Domestic ability to produce expected to reach a figure between 7,789,000 and 8,838,000 bbl. daily in 1955. . . . Further increase in ability to produce gas anticipated, with limiting factor the ability to transport it. . . . ¶Oil companies develop black-powder, seismic-shooting method in order to resume exploration in shallow waters off southern California after 2-year lapse. . . .

GOVERNMENT—House passes bill returning tidelands areas to states by a heavy 265-109 vote. . . . ¶Fourth-quarter steel allocation for oil and gas industry set at 1,806,000 tons. . . . This is 328,500 tons less than "minimum" asked by PAD, but 222,700 tons more than third-quarter allocation. . . . ¶Amendment to defense-production act blocks PAD's freeze on gas-service expansion.

INTERNATIONAL—British eye warily an Iranian bid to reopen oil negotiations. . . . House of Commons expected to accept offer this week. . . . Big Abadan refinery scheduled to shut down completely. . . . ¶Israeli Government reported preparing liberal new oil-concessions law. . . . ¶Adjournment of Iraq Government's suit against Iraq Petroleum Co. in London indicates Baghdad negotiations may be successful in ending dispute. . . . ¶Aramco buys world's largest, most complete drilling barge from Creole for Persian Gulf drilling. . . . ¶Manabi Exploration prepares to drill first wildcat on Engunga prospect. . . .

TRENDS—Stocks of major products continue to increase, reaching 267,348,000 bbl., compared to 233,539,000 bbl. a year ago. . . . But gasoline stocks dropped off 2,053,000 bbl. during the week. . . . Distillate stocks accounted for most of the gain, being up 2,390,000 bbl. . . . ¶Refinery runs dropped off 155,000 bbl. per day during the week, to average 6,406,000 bbl. . . .

ACTIVITY—Daily average crude production for week ended July 28 was 6,132,925 bbl., up 39,975 bbl. from previous week. . . . ¶Total completions for the week were up 102 wells to 916. . . . Wildcat completions were up only 1 well to 217, but total was 54 more than for same week last year. . . . ¶Rotary rigs operating in the United States on July 23 totaled 2,630, an increase of 20 over previous week and 413 over same date last year. . . .

PIPE LINES—British American, Canadian Shell, and McColl-Frontenac complete plans for 400-mile, 10-in. products line from Montreal, Que., to Hamilton, Ont. . . . Newly organized Trans-Northern Pipe Line to build and operate line carrying products from three Montreal refineries to western consumers. . . . ¶Texas Eastern awards contracts for 160 more miles of 30-in. gas line from Kosciusko, Miss., to Connellsville, Pa. . . . Only 3 of 12 sections of 791-mile line not yet under construction.

Uinta Development

Carter to spend $8,000,000 in basin this year; Duchesne offset, Roosevelt field development, wildcats planned

SALT LAKE CITY.—Rapid development of oil production in the Uinta basin of eastern Utah is in prospect as a result of plans of Carter Oil Co. to spend close to $8,000,000 in drilling and exploratory work in the area during 1951.

Stanolind Oil & Gas Co., Continental Oil Co., and The California Co. also are active in the Uinta basin, and the success of the limited development work since the first oil discovery 2 years ago has encouraged an extensive drilling program.

Carter's new program is considerably larger than the amount budgeted for Uinta earlier in the year but is in keeping with its general plans for the area. Carter pioneered in the basin and now feels justified in stepping up the pace of its development work. The Roosevelt field will be further drilled, an offset drilled to the new Duchesne wildcat discovery, and new wildcats will be started. Delay in securing Government approval of unitization agreements on public lands slowed drilling earlier in the year but several new locations are now ready to drill.

Actual production in the Uinta basin at present is very small, but completion of a few more producing wells would undoubtedly result in plans for a pipe-line outlet. It is possible that Platte Pipe Line Co. might extend its line from Wyoming in order to move the crude to the St. Louis area, or that a crude line would be built from the basin to refineries at Salt Lake City. A complicating factor is the high wax content of the crude, which solidifies unless heated.

Background.—The Uinta basin began its Tertiary-production history in July 1949 when Carter and Stanolind Oil & Gas Co. completed their 1 Ute Tribal, discovery well of Roosevelt field, for 1,633 bbl. of 35°-gravity oil from the Green River formation at 9,351-92 ft.

As an immediate result of this discovery long-neglected areas covering a major portion of the Uinta basin became attractive. Prior to this stratigraphically shallow discovery most of the Uinta basin was considered uneconomical because of excessive depths to potential pre-Tertiary rocks.

It was only a few years before the discovery of Roosevelt field that the Tertiary of the Uinta basin was condemned outright by some geologists. These students of the area said that the thick Tertiary section of the basin carried only "dead oil" which had been washed in and deposited at the same time as the sediments which carry it.

However, led by Carter, there were some geologists who, seeing enough similarity of conditions between the Uinta basin and the prolific Maracaibo basin of northwestern Venezuela, would not accept the dead-oil theory. Carter drilled four costly dry holes near Vernal, Utah, before its "mad" tactics were rewarded with a discovery at Roosevelt.

Since the initial discovery of Tertiary oil The California Co. recovered a little oil at Gusher and went on to open Red Wash field. In recent weeks Carter and Continental Oil Co. have an indicated discovery at their Duchesne unit wildcat.

Current activity.—There are now few skeptics about the potentialities of the Uinta basin. More and more major companies are moving into the area and establishing units for near-future drilling. Carter is still the most aggressive operator in the area. Stanolind operates with Carter in the Roosevelt unit. Phillips Petroleum Co. is drilling a "wildcat" to the west of Roosevelt. California Co. is active to the east of Roosevelt near its Gusher and Red Wash discoveries. Sun Oil Co. has a drilling well in the basin south of Roosevelt. Continental Oil Co. has a unitized block expected to be drilled in the near future.

An extremely interesting feature of some of the oil produced in the Uinta basin is its high pour point. At Roosevelt the crude will cease to flow at 90° F. and at Carter-Continental Duchesne wildcat the pour point of the crude is 100° F. This characteristic of the crude has made producing and transportation a unique problem. Currently oil is trucked to Salt Lake City in heated trucks. The Duchesne unit wildcat is producing with a hot-water circulating string run in the annular space to 3,916 ft.

Williston Highlights

Shell deepening Montana discovery; Amerada completes North Dakota producer; new strike is indicated in Canada

BILLINGS, Mont.—Shell Oil Co. 1 Northern Pacific Railroad, a rank wildcat about 210 miles northeast of here which last week indicated a highly important discovery for the western portion of the Williston basin, is being deepened to explore the extent of the oil-bearing section following inconclusive production tests.

Shell officials have still not released any specific information on their strike. Last official report said that "initial production tests . . . have now demonstrated that the well is capable of producing substantial quantities of 38°-gravity oil."

Unofficial reports are that the well made about 100 bbl. of 38°-gravity oil during the first 40 minutes of a production test made after drilling out plug in 7-in. casing cemented at 7,183 ft. Bottom of the hole at the time was 7,253 ft. Tests were made through a 1-in. choke.

As the well appeared to die after 40 minutes and then began flowing by heads, it is believed that the producing section of fractured Mississippian limestone was mudded off and that treatment with acid would bring a steady flow. A very low gas-oil ratio was indicated during the tests that were conducted over a 29-hour period. Total production during the 8½ hours that the well was open was nearly 350 bbl. of oil.

Location of Shell's well is 19-23n-50e, Dawron County, Montana. *(See The Oil and Gas Journal of July 26 for initial story of this important strike.)* Last reported depth for the well was 7,266 ft. It is believed that Shell will make frequent tests as the hole is carried deeper and that the limestone section will be acidized so that conclusive tests can be made.

Amerada completes well.—Meanwhile Amerada Petroleum Corp. has completed the first significant producer in the Williston basin. The 1 Clarence Iverson, 6-155n-95w, Williams County, North Dakota, 120 miles east of Shell's apparent discovery, flowed 12 bbl. of 39°-gravity oil hourly with 290,000 cu. ft. of gas daily from 10,490-10,530 ft. after acidization. Completion interval was more than 1,000 ft. higher than that which gave the initial indication that oil had been discovered in North Dakota last April.

Amerada has made location for a 1½-mile northeast extension to the recently completed discovery. It will be Amerada 1 Dilland, 31-156n-95w. The company is also drilling two rank wildcats in the general area. M. B. Rudman and C. Parsons are prepar-

ing to move in material at their 1 Matt Iverson, a 12,000-ft. test located 1 mile south of Amerada's discovery.

New discovery. — Another indicated discovery that will add heat to the accelerating exploration play in the general area of the international border is Socony-Vacuum Exploration Co. and Western Prairie Exploration Co. 1 Tompkins in southwestern Saskatchewan more than 200 miles to the northwest of Shell's well.

Located about 75 miles north of the Montana line and 55 miles east of the Alberta line, the 1 Tompkins flowed gas at the rate of over 2,000,000 cu. ft. daily on a drill-stem test at 3,631-3,661 ft. This interval is in the Hulett formation, a sandy limestone of Jurassic age, which is believed to be about 1,000 ft. above the top of the Devonian in this area.

This indicated gas discovery is now drilling ahead to test the Ordovician, expected at about 6,500 ft. The well is credited with the most significant show of light oil in Saskatchewan to date. Location of the test is LSD 14, 19-13-20w3.

CANADA

Product Line Planned

Trans-Northern buying right-of-way, completing design for 400-mile, 10-in. line from Montreal to Hamilton

C. O. Willson

TORONTO, Ont.—Plans have been completed for the laying of a 400-mile, 10-in., product line connecting three Montreal, Que., refineries with the principal consuming centers of Ontario as far west as Hamilton.

The line, which has been under consideration over the past year, is a joint enterprise of British American Oil Co., Ltd. Shell Oil Co. of Canada, Ltd., and McColl-Frontenac Oil Co., Ltd. (The Texas Co.), all of which have refineries in Montreal with large wholesale and retail distribution in the areas to be served with the line.

The line will be built and operated by the newly organized Trans-Northern Pipe Line Co. with headquarters at 25 Adelaide Street, East Toronto, Ont. A. N. Horne, widely known pipeline executive and engineer, is president of the company and will have charge of design and construction. Horne has been connected with the project since February. He came here from the Middle East, where he was vice president and general manager of the Trans-Arabian Pipe Line Co., which last year completed the construction of a 30-in. line connecting the oil fields of Saudi Arabia on the Persian Gulf with a terminal at Sidon, Lebanon. Horne has been connected with several major pipe-line projects in the United States including the "big inch" lines of World War II connecting Texas to eastern seaboard points.

Design plans.—The right-of-way for the Trans-Northern line is now being purchased and designs are being completed. The company will shortly be in a position to let contracts. Completion, probably late in 1952, is dependent on availability of pipe and other materials.

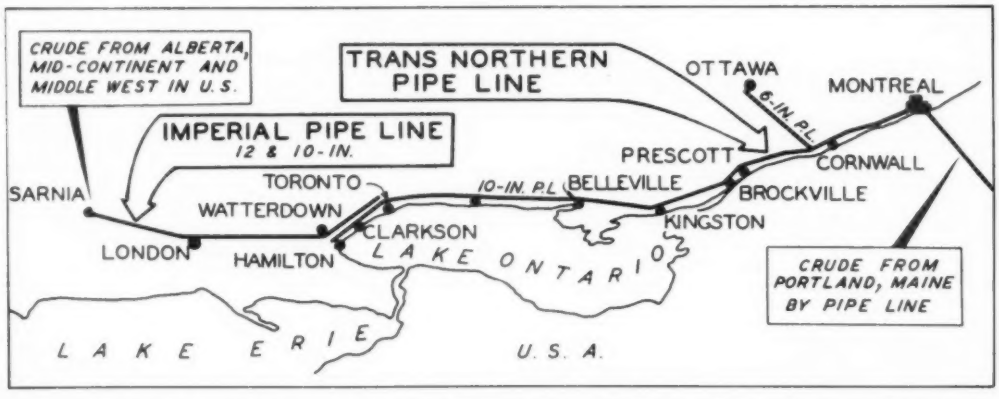
The design will include the latest development in the operation of product lines, including automatic features. The four initial stations will be operated with purchased electric power, which is available at substantially lower rates than in the United States.

The line, which will be designed to transport gasoline, diesel oil, furnace oil, and gas oil, will have an initial capacity of 40,000 bbl. daily, and this can be increased to 60,000 bbl. daily with the installation of four additional intermediate stations.

As shown on the accompanying map, the new line will extend along the north shore of the St. Lawrence River and Lake Ontario with terminals at Cornwall, Prescott, Brockville, Kingston, Belleville, Port Hope, Toronto, Clarkson, and Hamilton. A 6-in., 44-mile line will connect to Ottawa from a junction near Cornwall.

The line is another demonstration that this type of transportation now has a dominant competitive position in an area which in the past has been largely served by water movements. It is explained that whole the costs between water and pipe-line transportation in this case are approximately the same, there are other offsetting savings which favor the pipe line. During 5 winter months of the year the river and lake transportation cannot be used. This necessitates large storage at the refineries and terminals, along with the supplementary use of high-cost rail transportation during part of the year.

This seasonal transportation has become particularly important since the close of World War II owing to the large expansion in the sale of furnace and diesel oils and related intermediate products. With the new facilities the bulk of the movement of intermediate products and gasoline can take place during the seasons of greatest consumption with a minimum of storage. From the stand-



NEW LINE.—Route of the Trans-Northern product line to be built from Montreal to Hamilton. At left is the route of the product line planned by Imperial connecting its Sarnia refinery with Toronto.

point of materials, figures have been compiled showing that the new line will require less steel than would a program of water movement with large additional storage facilities.

Imperial project.—While the two projects are not related, it is noteworthy that the completion of plans for the Trans-Northern line follows the recent announcement of Imperial Oil, Ltd., that it would build a products line east from its Sarnia, Ont., refinery connecting to terminals at London, Hamilton, and Toronto.

This will consist of 125 miles of 12-in. and 60 miles of 10-in. The company has some of the required pipe on hand and hopes to have the line completed as far as London this year, with the entire project to be completed by the summer of 1952.

As shown on the accompanying map, the Imperial and Trans-Northern lines overlap in the Toronto area. It is pointed out that should it become expedient as a defense measure, or for some other reason, to connect the two systems, most of the principal refineries of eastern Canada could be operated as a unit in either the east or west movement of finished products.

Refineries.—The Sarnia refinery of Imperial, on the St. Clair River, has a crude-oil capacity of 55,000 bbl. daily. In the same area, at Froomfield, Canadian Oil Companies, Ltd., is building a 20,000-bbl. daily capacity refinery, and Sun Oil Co. last month announced plans to build a 10,000 to 15,000-bbl. refinery near Sarnia. Crude oil for these refineries comes by pipe line from the Middle West and Mid-Continent in the United States and via water and pipe line from the new Alberta fields.

The coowners of Trans-Northern have the following crude-oil capacities at Montreal refineries as of the first of the year; British American 32,000 bbl. daily; McColl-Frontenac, 40,000 bbl. daily; and Shell, 25,000 bbl. daily. These capacities are either being expanded this year or will be in 1952. Imperial Oil, Ltd., has a 44,000-bbl. refinery at Montreal.

These modern refineries obtain most of their crude-oil supplies from Venezuela, Colombia, and the United States via a pipe line from Portland, Me. In the Toronto area British American has a 10,000-bbl. refinery at Clarkson; McColl-Frontenac a 12,000-bbl. plant at Toronto, and Trinidad Leaseholds, Ltd., a 6,000-bbl. refinery at Port Credit. The Sarnia, Toronto, and Montreal refineries with the completion of the new plants will account for about 75 per cent of Canada's refinery capacity.

On the consumption side, Quebec and Ontario account for more than 50 per cent of the total demand in Canada. Most of this demand is in the population centers which will have terminals on the line.

Industry Briefs

NEW YORK.—Socony-Vacuum Oil Co., Inc., has ordered two 30,000-ton tankers to add to its present fleet of 55 deep-sea tankers. They will be the largest owned by the company. One will be 641 ft. long with a capacity of 250,500 bbl.; the second will be 644 ft. in length with a capacity of 254,800 bbl. Both are scheduled for delivery late in 1952.

DENVER, Colo.—A 5-week test has been completed in which a Denver freight yard switch engine operated solely on diesel fuel from the Bureau of Mines oil-shale demonstration plant at Rifle. A. E. Perlman, general manager of Rio Grande Railroad, and J. H. East, Jr., regional director, said the test produced excellent results and an engine inspection showed only normal wear and carbon deposition.

BARTLESVILLE.—Phillips Petroleum Co. this week announced that for the first time in company history a producing division had completed 1,000,000 man-hours without a disabling injury. The company's western division, including the Big Spring, Tex., and Hobbs, N. M., districts, reached the goal on July 25, completing the safety period which began 2½ years ago.

NEW YORK.—Gulf Oil Corp. last week launched a 798,000-gal. oil barge, the Manhasset, at Staten Island. One of the largest ever built for harbor and canal use, the barge is 230 ft. long and has a 43-ft. beam. Addition of the Manhasset brings Gulf's New York Harbor barge fleet to a total of 12.

WICHITA.—Kansas' crude-oil allowable for August has been set at 310,000 bbl. The figure is the same as that for May, June, and July. Purchasers' nominations for August totaled 347,322 bbl. a day, slightly above July nominations.

MIDLAND.—A new district office will be opened by Humble Oil & Refining Co. at Stanton, Tex., to direct the company's operations in the Spraberry area of West Texas, according to John W. House, Midland division superintendent. M. M. Rogers will be district superintendent at Stanton with his assistant being R. M. Lilly. Humble is the first major company to open a district office in Martin County.

SHREVEPORT.—The rig which drilled Louisiana's first successful well is being duplicated in preparation for the state's Golden Oil Jubilee September 21-23. The 60-ft. wood derrick with its old rotary equipment is being erected at Jennings, where the state's first productive well was brought in September 21, 1901. The replica rig will "spud in" September 21 in ceremonies opening the Jubilee.

SAN FRANCISCO.—Richfield Oil Corp. has filed suit against the federal Government for $2,146,386 it claims is due for use of ships requisitioned during World War II. Richfield's suit says the rate fixed by the Maritime Commission for use of the ships later was lowered by the War Shipping Administration in some instances, resulting in underpayment to the company.

OKLAHOMA CITY.—Oklahoma's crude-oil allowable for August and September will remain at 499,905 bbl. daily, unchanged from the permissible production rate set for May, June, and July. Purchasers nominations totaled 557,331 bbl. daily, and the Bureau of Mines had forecast a demand for Oklahoma crude of 530,000 bbl. daily.

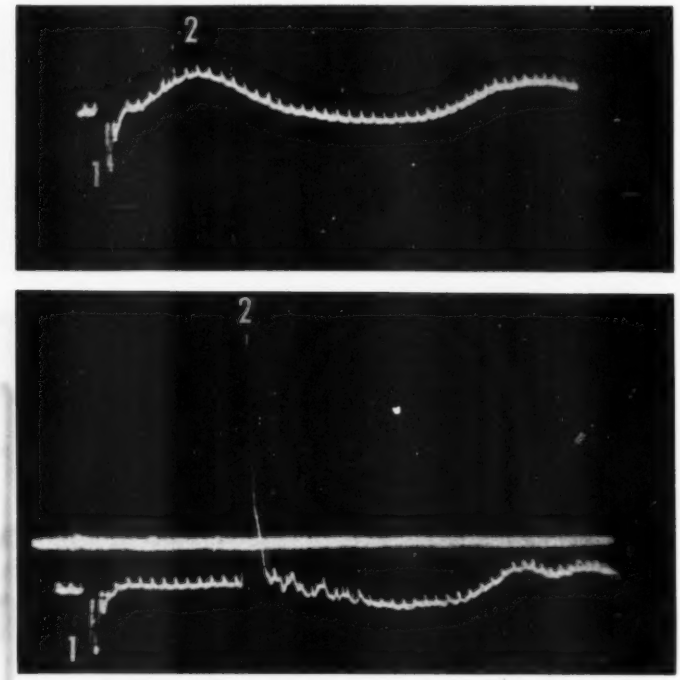
TOPEKA, Kans.—Smoky Hill Petroleum, Inc., has been granted a charter as a drilling and producing company.

SAN FRANCISCO.—The West Coast gas industry last week stepped aside to facilitate the signing of a Japanese peace treaty. The Pacific Coast Gas Association, which had scheduled its annual convention for September 4-6, relinquished all of its hotel space during that week at the request of the State Department, which announced that it wished to sign the treaty in the same location which saw the birth of the United Nations. The gas association rescheduled its convention for August 21-23.

SHREVEPORT.—William M. Barret, Inc., local geological firm, has been granted a $148,320 permit for construction of a new laboratory and office building.

HOUSTON.—Petroleos Mexicanos, Mexican Government oil agency, is reopening its Houston offices, which were closed in 1946 when the New York office was opened. Pemex will retain its New York office. Carlos Alvarez Garcia, formerly in New York, will be office manager here.

WICHITA.—A new weekly high for new oil production in Kansas was set last week when 52 tests were completed for a total production of 40,160 bbl. daily. This far exceeds the previous week's 168,654,000 cu. ft. daily from 12 completions.



BLACK POWDER VS. DYNAMITE.—Oscillograms of a black-powder explosion (top) and a dynamite blast (bottom) show why the latter is much more lethal to marine life. Points 1 show the time of explosion and 2, peak intensity. The black-powder explosion does not produce a compression wave with a steep shock front.

New Seismic Test

Oil companies to resume offshore exploration after developing black-powder method to reduce fish kill

D. H. Stormont

LOS ANGELES. — A new shooting method has made possible the resumption this September of seismic work in the shallow waters off southern California.

The method involves substitution of a slow-burning black powder for dynamite, thereby greatly reducing the number of fish killed by the explosion.

Permit for again conducting seismic operations was granted Union Oil Co. by the California Fish and Game Commission after experimental work with black powder showed that when charges for any shot were kept less than 40 lb. in weight and jetted at least 10 ft. under the ocean floor, no material harm was done to marine life.

The experiments, started last March, were a joint enterprise of the Scripps Institute of Oceanography and Union. The latter represented Shell Oil Co. and Continental Oil Co. in the project.

In the experimental work conducted off-shore between San Diego and Long Beach, the effects of small dynamite charges were studied first. These tests showed that many varieties of fish were damaged whether the charge was above the bottom or jetted into the ocean floor to depths of at least 65 ft.

Explosions of black powder, when the charge was from 4 to 40 lb. in weight and buried 10 ft. or more in a clay-sand bottom, were found to cause a fish kill of less than 0.1 per cent of that caused by dynamite. In surface shots black powder charges weighing about 45 lb. were found to produce variable effects, depending apparently on the type of container or on the number of detonators used. In all tests the effects of the blast were observed on free fish as well as those caged at various distances from the shot.

Findings.—Without going into theoretical causes and detailed findings, it appears that compression, rarefaction, and acoustic resonance are the factors which lethally damage fish.

The oscillogram of a black-powder explosion (top photo) shows the slow development of a peak pressure of small amplitude. In contrast, the dynamite explosion (bottom photo) shows a pressure peak of much greater amplitude with a sharp and abrupt front.

In the black-powder test, 5 lb. of powder was exploded after being jetted 10 ft. into the ocean floor. A peak pressure of 6.8 psi. was recorded by a hydrophone placed 19 ft. away. With dynamite, an equal weight was jetted to a depth of 45 ft. before detonating. It rendered a peak pressure of 83 psi. at a distance of 65 ft.

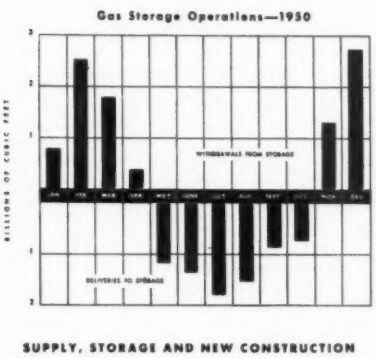
Location.—The exploratory work by the Union - Shell - Continental group was contracted to United Geophysical Co., and will be carried out between Point Dune (near Santa Monica) and Dana Point (about 30 miles below Long Beach).

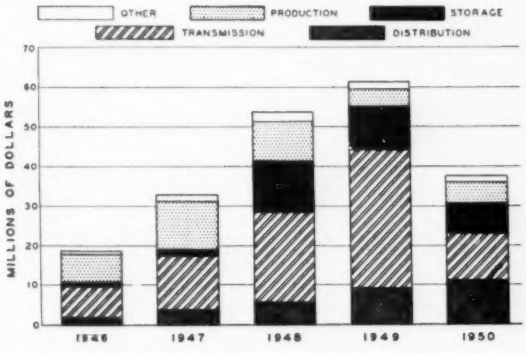
While working in water depths of less than 17 fathoms (102 ft.), black-powder charges weighing less than 45 lb. will be jetted more than 10 ft. below the ocean bottom. In deeper water, open shots of similar weight may be used if placed in a container or not less than 5-gal. capacity. All work will be observed by an employe of the Division of Fish and Game.

Background.—First seismograph operations along the California continental shelf were started in 1944. Between then and the fall of 1948 various companies explored parts of the near-shore area from Baja California northward to Point Conception.

Though the fish kill actually was not alarming (daily being less than the tonnage caught by only one of the many boats fishing there, according to individuals doing the work) the Division of Fish and Game ruled in the fall of 1948 that only one permit would be granted annually and that all interested companies must conduct the work jointly.

From October 1948 to August 1949 seismic work thus was done jointly, with the group varying from 3 to 18 companies. In this work reconnaissance surveys of the area between Dana Point and Point Estes were made, from 3 to 20 miles offshore. Then in August 1949 an exceptionally large number of fish were killed in one day, even though an employe of the Division was present. Since then no seismic work has been done.





STORAGE ECONOMICS.—At left is typical seasonal cycle of Equitable Gas Co.; at right, a graphic breakdown of 1946-1950 budget of Columbia Gas System, Inc.

Gas-Storage Growth

Problem of meeting seasonal peaks means expenditure of $67,000,000 for underground storage this year and next

Joseph A. Kornfeld

THE construction of underground storage facilities for natural gas near areas of heavy winter consumption has reached the proportions of a major development in the natural-gas industry.

This trend promises to go far toward solving the troublesome problem of seasonal peak loads, and should lead to a more even flow of gas from wells through transmission lines throughout the year, as well as more assurance of uninterrupted winter service to consumers.

In all gas-consuming areas of the country, but particularly in the northeastern states, gas-transmission companies are searching for exhausted gas fields and other geological formations suitable for holding huge quantities of natural gas without loss or contamination. Testing such natural reservoirs and converting them to storage by drilling the necessary wells and laying pipe-line networks is running into big money.

Some transmission companies have allocated as much as 30 per cent of their construction budgets for underground storage. American Gas Association reports that gas utilities as a group will spent more than $67,000,000 for underground storage facilities this year and next *(The Oil and Gas Journal, June 28, 1951.)*

Big project.—For example, Consolidated Natural Gas Co., with an extensive network in the Appalachian area, is spending $20,000,000 this year to develop three major projects of this type in western Pennsylvania—at Oakford, South Bend, and Sabinsville. One project alone will cost nearly $14,000,000. During 1950, another big company, Columbia Gas System, Inc., spent nearly $8,000,000 for construction of underground-storage facilities. For the current year it has allotted a major portion of its $50,000,000 construction budget for building underground storage.

In Ohio more than $6,000,000 will be spent to convert six gas-producing pools to storage, and in Michigan another $6,000,000 has been allocated by Michigan Gas Storage Co. for storage facilities in 1951. In the Southwest, the region's biggest storage project will begin operating this month following a $2,000,000 expenditure.

Huge capacity.—Biggest project building is Oakford reservoir near Pittsburgh, designed for a maximum deliverability of 400,000,000 cu. ft. per day. Estimated to cost $13,700,000, it will have a total capacity of 105 billion cubic feet. Of this total there will be a permanent inventory or "cushion" of 45 billion, leaving 60 billion cubic feet available for storage and withdrawal.

This project is to be operated by New York State Natural Gas Corp., subsidiary of Consolidated Natural Gas Corp., and Texas Eastern Transmission Corp. Additional gas available to Texas Eastern from this project will be used to meet winter peak loads of Algonquin Gas Transmission Corp. for its proposed New England market and of other customers of the company's Big Inch system. New York State Natural will sell storage gas to Peoples Natural Gas Co. and East Ohio Gas Co. to meet winter demands of customers of those companies.

The South Bend project northeast of Pittsburgh will have a maximum deliverability of 264,000,000 cu. ft. of gas per day on completion. Thirteen billion cubic feet of gas would be put back into this reservoir above minimum cushion requirements. Big item on the $8,969,100 project is a 12,000-hp. compressor station. New York State Natural and East Ohio Gas Co. are cooperating to build this storage.

Columbus group of Columbia Gas, represented by Ohio Fuel Gas Co. of Columbus, has earmarked $6,425,000 to convert six gas fields to storage in Central Ohio. This is a part of a 5-year, $60,000,000 expansion program designed to replace depleted Ohio gas fields with gas from the Gulf Coast. Gas goes into four of these converted fields this summer and into the other two in mid-1952. Ohio Fuel has signed new contracts for deliveries of 100,000,000 cu. ft. of gas per day for summer storage into its system from Transcontinental Gas Pipe Line Corp. and its customers.

In the Southwest the third and largest gas-storage project operated by Oklahoma Natural Gas Co. goes into summer storage service this month at Depew, 50 miles southwest of Tulsa. Built at a cost of $2,000,000, the Depew project will supply an estimated 15 per cent of the company's total heating-season load.

Today, Oklahoma Natural buys 85 per cent of its purchased gas requirements in the form of residue gas from gasoline plants like those operating at West Edmond and last week started moving gas eastward through its newly constructed $2,750,000, 26-in. transmission line to Depew storage.

An abandoned gas field, the Depew project covers 1,900 acres, has 48 bil-

TEN RANKING STATES IN UNDERGROUND GAS STORAGE*

State—	Gas in storage billion cu. ft.† end of 1950	Per cent of total
1. Ohio	73.814	21.61
2. Pennsylvania	57.852	16.94
3. West Virginia	56.166	16.45
4. Michigan	32.301	9.46
5. Kansas	29.301	8.59
6. Oklahoma	24.369	7.13
7. California	19.156	5.61
8. New Mexico	18.086	5.29
9. Kentucky	11.586	3.39
10. New York	10.809	3.12
11. All other states	8.247	2.41
Total	341.690	100.00

*Source: American Gas Association Committee on Reserves, N. C. McGowen, United Gas Corp., chairman. †All volumes measured at 14.65 psia. at 60° F.

lion cubic feet capacity, and when filled with its cushion of 34 billion cubic feet will have 14 billion cubic feet avaliable for storage-and-withdrawal usage. Depew dwarfs Oklahoma Natural's older Haskell and Osage storage projects.

Storage reasoning.—Gas storage is needed in the East for several major reasons. Basically, there is a 17-year-old shortage of natural-gas supplies from the low-capacity, small-reserve gas fields of the East. Record expansion of gas markets into New York area and New England has imposed huge responsibilities on already overtaxed major integrated eastern systems already tied in with many transcontinental big-inch lines from Gulf Coast fields.

The seasonal character of requirements imposes violent fluctuations in loads on the eastern systems for the five winter months of big heating demand starting early in November. For example, Columbia Gas withdrew as much as 842,000,000 cu. ft. of gas in a single day last winter from its Appalachian system. But it took 13 years and $34,000,000 to build up the network of storage fields to this capacity. Half of the money went to revamp old field facilities, the other half to fill it with gas.

To build southwest big-inch pipe lines with the ability to deliver this amount of gas in a single day would cost in the order of $150,000,000 or five times Columbia's investment underground. Last year, one out of every five dollars spent by Columbia went into storage facilities.

Winter peaks present a difficult problem for eastern gas companies. Take a peak-day experience of the Equitable Gas System of Pittsburgh, which operates big storage pools in Pennsylvania and West Virginia. Last winter, there was a peak-day withdrawal of as much as 375 million cubic feet. Storage gas furnished fully one-third of the load, or 125 million cubic feet. Remainder of 250 million was divided equally between system production and purchased gas.

Appalachian reserves.—Eastern gas companies can't expand production in the Appalachian region, which has only 2 to 3 per cent of the nation's proved recoverable gas reserves. On the other hand, more than 84 per cent of the big gas-field reserves are found in the four states of Texas, Louisiana, Oklahoma, and Kansas. Thus, for a system like Columbia, with 8.5 trillion cubic feet of gas reserves on the books, only 2.2 trillion, or about one-fourth, lies in Appalachian or eastern fields, and this sprawling system must depend upon southwestern gas contracts representing the lion's share, or 5.6 trillion cubic feet. Remainder of 0.7 trillion cubic feet is in the form of potential—but not proven—gas reserves.

Expansion steps.—To insure an adequate supply of natural gas for its system for the coming winter season, Columbia not only has boosted its storage facilities to new highs but is signing up new contracts for deliveries into summer storage. Columbia now has about 100 billion in storage, hopes to increase this amount to 160 billion by October 1951. Consolidated has doubled its storage in the last 4 years, had 78 billion in storage on hand at the beginning of this year. Equitable Gas had trebled the amount of gas in storage at the beginning of the 1950-51 heating season over that of 5 years ago.

Long-range planning.—This big movement in underground storage has its roots as far back as 1933. In that year, Ohio Fuel Gas started to replace its depleted Ohio gas reservoirs with out-of-state gas; volumes in storage rose from a modest 33,000,000 cu. ft. in 1933 to 53 billion in four storage areas as of last fall. Others, like Equitable, started back in 1936 to build their storage program, now have 11 underground projects in operation in Appalachian fields. Michigan-Wisconsin started out modestly, had as much as 28 billion cubic feet in undergroud gas above cushion at the beginning of the current year.

But the impetus came in 1943 when Appalachian gas imports exceeded exports for the first time. Superimposed on this shortage came the wartime needs of heavy industry and which brought into being the first Big-Inch gas pipe lines. The big push came in 1948 as reflected by the sharp jump in storage expenditures for a system like Columbia.

States help.—Right of eminant domain has been conveyed to the gas companies by Oklahoma, Kansas, New Jersey, and Pennsylvania. This facilitates acquisition of title to reservoirs for storage. In Congress the pending Douglas-Dirkson bill would give natural-gas companies throughout the nation the right of eminent domain for acquiring storage reservoirs.

Long Safety Record

Capt. John Abel, master of the Mississippi River towboat Anker L. Christy is shown here receiving the American Petroleum Institute accident-prevention award from Pure Oil Co. Vice President Kenneth A. Covell. Abel and his crew in 10½ years piled up 585,975 man hours without a disabling injury. The award covers the period between August 4, 1941, and March 31, 1951. The presentation was made July 28 in Memphis in ceremonies honoring Abel and his crew. Left to right are Woodrow Wilkins, Capt. Abel, Capt. Ray Durden, port captain at Memphis, Capt. H. Paul Striegel, Covell, and Chief Engineer Manning H. Kemp. The Christy is a triple-screw-type tow boat. It is 108 ft. in length and has a 30-ft. beam. With its regular four-barge tow load it measures 590 ft. in length and has a carrying capacity of 5,000,000 gal.

How Much Oil in 1955?

NPC committee says every year through 1955 will see a further gain in petroleum availability here and abroad

WASHINGTON. — The world's oil fields outside Russian dominated areas will be able to produce between 13,146,000 and 15,132,000 bbl. of crude oil daily during 1955.

This is the short-term view of the National Petroleum Council's Committee on Oil and Gas Availability. It compares with an all-time record production in May of 11,039,600 bbl. daily outside the Russian-controlled areas.

Total petroleum production, including natural-gas liquids, is expected to reach between 13,881,000 and 15,977,000 bbl. daily.

And, the committee says, these estimates are conservative. Previous forecasts made on the same basis, it points out, have since been proven to be on the low side.

This interim report was requested last December 1 by H. A. Stewart, director of the Oil and Gas Division of the Interior Department. A long-term report on the availability of oil and gas is now being prepared under the direction of Max Ball, former director of the Oil and Gas Division, and is expected to be presented at a meeting of the National Petroleum Council in October.

Domestic forecast. — In 1955 this nation's ability to produce crude oil is expected to be from 270,000 to 1,065,000 bbl. daily greater than in this year.

The subcommittee submitting the report on the domestic picture estimated this year's availability of crude oil at between 6,842,000 and 6,988,000 bbl. daily. Current production is about 6,100,000 bbl. daily.

It forecast a gradual increase during the coming years, with a minimum availability of 7,114,000 and a maximum availability of 8,053,000 bbl. daily during 1955. (See Table 1).

The domestic subcommittee, headed by Hines H. Baker, Humble Oil & Refining Co., predicted a gradual increase also in the availabilty of natural-gas liquids, with a total availability of all oils in 1955 reaching a figure within a range of 7,789,000 to 8,838,000 bbl. daily.

In submitting the report, L. F. McCollum, Continental Oil Co., chairman of the over-all committee, said the estimates are based upon these assumptions:

1. A continuation of a system of a private competitive enterprise.

2. Maintenance of conservation practices developed by industry and state agencies.

3. Adequate supplies of materials and manpower, with steel supplies for drilling and equipping wells falling no lower than 1951 needs as estimated by the NPC committee on petroleum-industry requirements.

4. Continuation of present tax provisions and regulations regarding petroleum production.

On January 1, the committee said, this country had an availability of all oils of 7,300,000 bbl. daily including production of 6,465,000 bbl. daily and a reserve capacity of 835,000 bbl. daily. (See Table 2).

Its projection of increasing productive ability indicates that availability in 1955 will exceed the January 1 figure by 489,000 to 1,538,000 bbl. daily.

Estimates' range explained.—Explaining the lower and upper estimates, the subcommittee said the lower estimate "is one that can easily be attained with steel supplies continued at the rate allocated for 1951."

The upper estimate, it said, "may be attained with success in new discovery and development comparable with that realized during the past 5 years."

Changes in availability, it pointed out, "are directly related to drilling," and it said the strides made by the industry in boosting availability since 1945 were due to "the expenditure during the past 5 years of about 10 billion dollars for exploration and development."

In addition to the assumptions listed by McCollum, the domestic subcommittee emphasized that it's forecast was based also upon the resumption of operations on the Continental Shelf.

"The subcommittee has assumed," it said, "that the controversy over title to these lands will be settled

TABLE 3—FOREIGN PETROLEUM AVAILABILITY, 1951-1955
(Thousands of barrels daily)

1. Crude Oil

	Western Hemisphere		Eastern Hemisphere		Total foreign	
	Lower	Upper	Lower	Upper	Lower	Upper
1951	2,336	2,386	2,545	2,590	4,881	4,976
1952	2,401	2,546	2,892	3,104	5,293	5,650
1953	2,446	2,706	3,325	3,682	5,771	6,388
1954	2,481	2,856	3,441	3,883	5,922	6,739
1955	2,511	3,011	3,521	4,068	6,032	7,079

2. Natural-Gas Liquids

1951	24	28	52
1952	25	28	53
1953	26	30	56
1954	27	30	57
1955	28	32	60

3. Total Petroleum Liquids

1951	2,360	2,410	2,573	2,618	4,933	5,028
1952	2,426	2,571	2,920	3,132	5,346	5,703
1953	2,472	2,732	3,355	3,712	5,827	6,444
1954	2,508	2,883	3,471	3,913	5,797	6,796
1955	2,539	3,039	3,553	4,100	6,092	7,139

TABLE 1—UNITED STATES PETROLEUM AVAILABILITY, 1951-1955
(Thousands of barrels daily)

	Crude oil projected range*		Natural-gas liquids projected range		Total liquids projected range	
	Lower	Upper	Lower	Upper	Lower	Upper
1951	6,842	6,988	567	578	7,409	7,566
1952	6,976	7,333	620	674	7,596	8,007
1953	7,065	7,624	679	760	7,744	8,384
1954	7,105	7,854	676	773	7,781	8,627
1955	7,114	8,053	675	785	7,789	8,838

*These estimates assume that production is continuously at the maximum efficient rate. If production is less than availability at times, the decline in availability from old wells will be reduced and the availability in subsequent years will be increased slightly.

TABLE 2—UNITED STATES PETROLEUM AVAILABILITY, JANUARY 1951
(Thousands of barrels daily)

	Availability			Production			Reserve productive capacity		
	Crude oil	Natural-gas liquids	All oils	Crude oil	Natural-gas liquids	All oils	Crude oil	Natural-gas liquids	All oils
1—East Coast	54	19	73	54	19	73	0	0	0
2—Mid-Continent	1,083	72	1,155	1,077	72	1,149	6	0	6
3—Southwest	4,161	383	4,544	3,525	377	3,902	636	6	642
4—Rocky Mountain	350	9	359	292	7	299	58	2	60
5—California*	1,079	90	1,169	959	83	1,042	120	7	127
Total U. S.	6,727	573	7,300	5,907	558	6,465	820	15	835

*Including Elk Hills.

TABLE 4—FOREIGN PETROLEUM AVAILABILITY, JANUARY 1951
(Thousands of barrels daily)

	Productive capacity			Production			Reserve productive capacity		
	Crude oil	Natural-gas liquids	All oils	Crude oil	Natural-gas liquids	All oils	Crude oil	Natural-gas liquids	All oils
Canada	165	2	167	95	2	97	70		70
Latin America	2,130	22	2,152	2,126	22	2,148	4		4
Total	2,295	24	2,319	2,221	24	2,245	74		74
Europe	86	24	110	86	24	110			
Middle East	2,000		2,000	1,874		1,874	126		126
Far East	270	4	274	265	4	269	5		5
Total	2,356	28	2,384	2,225	28	2,253	131		131
Total foreign	4,651	52	4,703	4,446	52	4,498	205		205

promptly and that the industry will then be permitted to proceed immediately with normal development."

If this develops, it said, "it is estimated that about 1,000 wells will be drilled on the Continental Shelf over the next 5 years," increasing availability from this area about 100,000 to 200,000 bbl. daily, depending upon the need for oil.

Delay in development, it continued, will reduce availability within 5 years "below the estimate included in this report."

Foreign estimate.—The foreign-availability subcommittee, headed by John R. Suman, Standard Oil Co. (N. J.), set availability as of January 1 at 4,703,000 bbl. daily, exclusive of the Iron Curtain countries.

In 1955, this subcommittee said, foreign availability should total between 6,092,000 and 7,139,000 bbl. daily. (See Tables 3 and 4).

The subcommittee said its forecast of a continued increase in foreign productive ability is based on these assumptions:

1. That economic activity will continue at a high level and adequate profit incentive will prevail.
2. That supplies of steel and other materials will be no less than in 1950.
3. That adequate manpower will be available.

Principal increases, it said, are expected in Latin America and the Middle East, with Canada becoming potentially more important in view of discoveries there in recent years.

Asserting that foreign areas have "very great prospects of future discoveries" in a potentially productive area "many times that of the United States," the committee said:

"Over the long term, development of productive capacity in foreign areas will be dependent upon the need for supplies and the legal, political, and economic climate in which to work. Give the industry (1) legal climates which permit a free competitive system throughout the world, (2) a political philosophy which recognizes legal rights of contracts, and (3) an economic climate offering the opportunity of a reasonable profit; then it will make available ample petroleum supplies to meet the growing needs of the world for many years to come."

Gas Outlook

Availability to be 9.5-11.9 trillion cubic feet by 1955

WASHINGTON.—The United States will have enough available natural gas to support production of between 9.5 and 11.9 trillion cubic feet a year by 1955.

This is the estimate of the National Petroleum Council's Committee on Oil and Gas Availability, submitted in the committee's report at the recent N.P.C. meeting here.

Availability this year was estimated at 8.1 to 9.5 trillion cubic feet. Actual production in 1950, the committee said, was 6.9 trillion cubic feet.

"These estimates are deliberately conservative," the report said, "because the limiting factor on utilization of natural gas at present is still the capacity of pipe-line facilities . . . rather than the maximum efficient rate of production."

Current availability, it added, "substantially exceeds the combined total of local consumption plus the capacity of existing large pipe lines."

The upper availability estimate for 1951 is 39 per cent more than 1950 production. By 1955, estimated availability is 39 to 72 per cent greater than production in 1950.

In its conclusions the committee pointed out that during the past 5 years the gas industry produced 29.7 trillion cubic feet, increased reserves by 37.8 trillion cubic feet after replacing the 29.7 trillion produced, and increased net production from 4.9 trillion cubic feet in 1946 to 6.9 trillion cubic feet in 1950.

Year by year projections of natural-gas availability through 1955 are shown in the accompanying table.

PROJECTED AVAILABILITY OF NATURAL GAS
(Billion cubic feet annually)

	Nonassociated gas		Associated gas		Total gas	
	Lower	Upper	Lower	Upper	Lower	Upper
1951	4,738	6,149	3,326	3,398	8,064	9,547
1952	5,085	6,619	3,403	3,593	8,488	10,212
1953	5,398	7,055	3,462	3,760	8,860	10,815
1954	5,690	7,467	3,501	3,891	9,191	11,358
1955	5,966	7,860	3,523	4,003	9,489	11,863

MID-CONTINENT

Osage-Unit O. K. Sought

TULSA.—Approval from the Secretary of the Interior for creation of a unit to conduct water-flooding in the Bartlesville sand reservoir of the Naval Reserve field of Osage County will be sought this month by The Texas Co. as operator for eight companies. Copies of the unitization are now being circulated to operators for signature.

Naval Reserve Unit, one of the largest proposed water-flood projects in the Mid-Continent, will comprise 2,735 acres on which there are 250 producing oil wells. The Bartlesville sand, found at a depth of 2,800 ft., produces under a localized, but not fully effective, water-drive operation on the west side of the field. Spacing pattern has been 10 acres.

Members of the proposed unit other than The Texas Co. include Continental Oil Co., Gulf Oil Corp., Sinclair Oil & Gas Co., Champlin Refining Co., Tide Water Associated Oil Co., Phillips Petroleum Co., and Skelly Oil Co.

The field lies in Township 24n-7e in western Osage County 5 miles southeast of old Burbank oil field, locale of another major water-flood.

South Ceres Unit Planned

OKLAHOMA CITY.—Petition for unitization of the Bartlesville sand zone in the narrow, meandering South Ceres field of Noble County, Oklahoma, was filed here last week with the Corporation Commission. Hearing is set for September 18.

The order would cover 2,880 acres lying in Sections 3, 4, 5, and 9-22n-1w, and 23, 24, 25, 26, 34, and 35-23n-1w.

Continental Oil Co. filed the petition as proposed unit operator for itself and 18 other companies including Ashland Refining Co., B. B. Blair, Breuil Petroleum Co., Deep Rock Oil Corp., Fidelity Royalty Corp., Kingwood Oil Co., Simon Lebow, C. A. McCann, Mora Drilling Co., Hugh E. Rapp, Earl R. Rapp, Robert E. Rapp, Fourdee Rhoades, Sinclair Oil & Gas Co., Stanolind Oil & Gas Co., Sohio Petroleum Co., Tide Water Associated Oil Co., and Charles R. Walbert & Co.

Rollover Gas Moving

Pure Oil producing offshore field by means of big platform, marine pipe line, and shore dehydrators

F. Lawrence Resen

CAMERON, La.—A shut-in well just doesn't pay off, and when it's a gas-distillate well located offshore in the Gulf of Mexico unique production problems have to be solved before the well can flow.

Pure Oil Co. engineers licked the problems and after almost a 2-year delay, during which the field was shut in, the four wells in Rollover field located 55 miles southeast of here are now producing 25,000 M.c.f. per day of gas.

Final stages in getting the field on production involved the installation of separators on a specially built platform. Pure engineers designed a 39 by 50-ft. steel platform, mounted on steel pilings, to be constructed adjacent to the drilling and pipe-rack platforms which were built during the drilling phase.

Separator hookup.—Each of the four wells is connected to its individual separator mounted on the platform. These low-temperature extraction units operate under a pressure drop from flowing-well pressure of approximately 3,000 psi. to a delivery pressure of approximately 1,100 psi.

Condensate and gas from each separator is individually processed, providing a check on individual-well output. The condensate and gas are then recombined in a common header and transported to shore by pipe line.

The separators normally are constructed without scrubbing units. Pure engineers felt, however, that the high rate at which the gas would enter the separators might allow sand to be introduced into the system. Consequently, they had baffle-type scrubbers placed on the well side of the extraction units.

Water separated from gas-distillate is shunted to a skimming tank where any trapped condensate may be recovered before the water is disposed of.

Pipe line.—To transport the gas-distillate to shore, Marine Gathering Co., Houston, built a pipe line and separation-dehydration station. The ocean-going pipe line runs under the Gulf of Mexico 8 miles to shore, thence an additional 6¾ miles to a point on Pecan Island. The line up to this point is 8-in. At Pecan Island it becomes 12-in. for the remaining 12½ miles to the Tiger Island separation-dehydration plant, located about 65 miles southeast of Lake Charles.

The plant is designed for an ultimate capacity of 50,000,000 cu. ft. per day at a nominal operating pressure of 1,000 psi. Installations consist of stage-separation units, dry-bed dehydration units, metering stations, and storage tanks. Deliveries of dry gas are made directly into Tennessee Gas Transmission Co.'s system at this point.

The condensate is placed in Pure stock tanks, from which it is hauled by truck 25 miles to Creole, where it is pumped into the Creole pipe line running from offshore Creole field to an Intercoastal Canal terminal. The condensate mixes with crude from Creole, and this mixture is barged to the 60,000-bbl. Smiths Bluff refinery which Pure operates at Nederland, Tex.

Other structures.—When the field was originally being drilled, two platforms were constructed on steel pilings. The drilling platform is 50 by 98 ft., and the pipe-rack platform is 50 by 60 ft. These are separated by about 4 ft., but are connected to provide an over-all platform of 162 by 50 ft.

The latest structure to be installed is the quarters platform, 60 by 60 ft. This is set off from the other platforms and is connected by catwalks.

Communications. — A 150-watt, two-way radio transmitter is maintained for communication between the shore facilities and the platform. A converted YMS naval craft is used for transportation to the offshore site. An operating crew of two men is maintained on the platform except in extreme storms and hurricanes. During such times, the field is shut in and all equipment secured for foul-weather conditions.

Design of Pure Oil drilling and production platforms was done under supervision of I. W. Alcorn, division production engineer on the Gulf Coast. R. C. Ledford, operations manager for Marine Gathering, designed the separation-dehydration plant.

Leasing Conflict

Louisiana defies Chapman in accepting offshore bids

BATON ROUGE.—Louisiana's Mineral Board has leased a Breton Sound tract, portions of which lie outside a line which the federal Government claims limits state ownership under a decision of the U. S. Supreme Court.

Defying a request that it withdraw from bidding nine tracts that Secretary of Interior Oscar Chapman said were in federal territory, the board agreed with its attorney that the line is "unilateral."

Chapman, in a letter to Board Chairman O. G. Collins, had described the line as having been delineated last March 16 by the Solicitor General as "the landward boundary of the offshore area covered by the decision and decree of the Supreme Court in United States vs. Louisiana."

Chapman added that "Both the Department of Justice and the Department of Interior are of the opinion that the State of Louisiana has no authority to lease such lands."

Opposing opinion. — In its meeting July 26 the board heard an opinion by John Madden, special assistant state attorney general, that Louisiana could not recognize as official a line "superimposed (on geodetic charts) by someone presuming to act for the United States in attempting to fix the boundary between the inland waters and those extending seaward from the low water mark."

He added that "This action, in superimposing the line, was not made under court direction, and, in the absence of the consent and approbation of some authorized representative of the State of Louisiana, must be viewed and being unilateral in nature."

Before opening bids, the board read aloud both Chapman's letter and the answer by Madden, and asked if any bidder wished to withdraw. None did.

In the most clearcut conflict, the board accepted a bid by Kerr-McGee Oil Industries of Oklahoma City, $101,000 cash bonus for a 1,377.9-acre strip across the northern portion of Block 45, in "St. Bernard and/or Plaquemines parishes."

Chapman had designated nine offered tracts which he claimed included some federal territory.

Louisiana Shakeup

BATON ROUGE. — The Louisiana State Conservation Department has been shaken up to provide better service to those seeking information on the state's petroleum activities. According to Commissioner S. L. Digby, changes were made in both methods and personnel of the Baton Rouge office production-reports section.

This has now been designated the audit section of the engineering division.

The new system is designed to make gas and oil-production figures and compilations from the thousands of leases in the state's 422 fields available quickly.

Both oil and gas are traced from production to refineries or other uses or until they leave the state, he said.

NATIONAL AFFAIRS

No Mexican Deals

Oil-steel trade rumors groundless, Chapman says

WASHINGTON.—Interior Secretary Chapman's visit to Mexico last week brought about no deals of any kind.

That was the import of Chapman's statement here July 27, immediately after he and Bruce K. Brown, deputy administrator of Petroleum Administration for Defense, returned to Washington after a 2-day visit to Petroleos Mexicanos installations.

Without saying so in so many words, both Chapman and Brown sought to refute stories emanating from Mexico, that Mexico had offered to trade oil for steel.

Brown said that Mexico's applications for steel allotments had been on file for some time, that presumably Mexico would apply for steel for the first quarter of 1952, and that there "wasn't anything new."

He noted that, for the third quarter, Mexico got about one-tenth the steel allotted to foreign users — enough to drill about 65 wells. Mexico's production is only in the neighborhood of 200,000 bbl. a day.

Chapman asserted flatly that he discussed with neither Sen. A. J. Bermudez nor President Aleman any idea of trying to get American companies to go back into Mexico.

The reason for the trip, it was indicated, is this:

Oil is a hot political issue in Mexico. Consumption is increasing. Pemex wants steel as much as anyone else, and wanted United States officials to come down there and listen to their plea first hand. As a matter of good will, Chapman went along. Mexico will get regular quarterly allotments of steel, but probably no more nor no less than if Chapman had never made the trip.

Gas Order Blocked

Defense-act amendment stymies PAD limitations

WASHINGTON.—A defense-production act carrying the Bow amendment, which would limit Petroleum Administration for Defense authority to impose a freeze on expansions of natural-gas service, was sent to the White House this week by Congress.

PAD officials meanwhile were considering what they could do to avoid severe shortages of gas this winter in vital areas. The congressional action makes impossible the issuance of the comprehensive order laid before the Gas Industry Advisory Council last week.

The Bow amendment forbids any federal order restricting use of natural gas in any state where a state regulatory agency has this power and certifies to the President it has used the authority.

Limitation orders already are in effect in a number of states, some of them adopted several years ago, and the area in which PAD could act would be sharply restricted.

Restrictions, it was developed during House debate on the amendment, are in effect in most of Illinois, eastern Missouri, most of Indiana, central and southern Ohio, eastern New York, many New England areas, all of Michigan, the Carolinas, parts of Georgia and Florida, and to a limited extent in New Jersey, most of Minnesota, Nebraska, and part of Pennsylvania.

Tidelands Vote

House passes bill giving areas to states, 265-109

WASHINGTON. — Acting affirmatively for the third time, the House this week passed legislation restoring title in the tidelands to the states.

The 265-109 vote was considerably in excess of the two-thirds necessary to pass the bill over a presidential veto, but the margin will be much slighter and may even be the other way in a showdown on a veto in the Senate, to which the measure now goes.

Under the bill, the coastal states would own the tidelands out to their 3-mile limit with the exception of Texas, where the limit would be 10½ miles, and they would receive 37½ per cent of any revenue from oil or other operations beyond those limits to the edge of the Continental Shelf. The Government's share of such revenues would be applied to reduction of the national debt.

The House beat down, by decisive votes, all efforts to maintain the status quo for 5 years or permit the secretary of the interior to issue leases on the submerged lands.

The House twice before passed similar legislation. The first time the bill was vetoed by President Truman. The second bill, 2 years later, died in the Senate.

FTC Hits Oil Firms

WASHINGTON.—The Federal Trade Commission issued a formal order this week directing five Standard Oil companies and Atlas Supply Co. to discontinue monopolistic practices in the purchase and resale of tires and other TBA products.

The order, directed to the Standard Oil companies of Ohio, Kentucky, California, Indiana, and New Jersey, affirms a trial examiner's initial decision of June 5. *(The Oil and Gas Journal, June 21, page 155).*

The commission's order prohibits the six companies from joining in any way to use their combined vast purchasing power to force manufacturers to give them lower prices, discounts, or rebates that are denied their competitors.

Steel Quota

Fourth-quarter allocation for oil is 1,806,500 tons

WASHINGTON. — The oil and gas industry will get 1,806,500 tons of steel for the fourth quarter.

This is 328,500 tons less than "minimum" which Oscar Chapman, Petroleum Administration for Defense chief, requested.

It is, however, 222,700 tons more than the 1,583,800 tons of steel which the Defense Production Administration allotted the industry during the third quarter.

DPA Administrator Manly Fleischman said that fourth-quarter allotments generally compare more favorably with supply than those for the current months. This, he explained, is because the Controlled Materials Plan became more effective in the fourth quarter, whereas there was an overlap between CMP and priorities regulations during the current quarter.

Defense Orders Issued

WASHINGTON.—The following orders have been issued by the National Production Authority:

M-76, July 26: Puts soft pig lead under allocation.

M-38 amended, July 26: Removes all restrictions on distribution of lead so that they may be covered by the new M-76 order, above.

M-67, amended, July 27: Adds to use limitations of aluminum foil.

Military Buying Centralized

WASHINGTON.—Military procurement has been further centralized to make it easier for contractors doing business with the armed services and minimize the impact of the huge defense orders on the national economy.

In the latest of a series of shakeups in the Munitions Board, that agency is given more authority and interference by the Army, Navy, and Air Force will be lessened by changes in their representation on the agency to bring in officials not concerned with procurement for their particular services.

MIDDLE EAST

Hope Renewed

British study Iran's bid to reopen oil negotiations; big Abadan refinery scheduled for complete shutdown

Dahl M. Duff

THE British Government early this week warily studied an Iranian proposal to resume negotiations on the oil-nationalization issue.

The approach to London came as a result of efforts of W. Averell Harriman, President Truman's personal representative, who has been in Teheran since July 15 seeking a basis on which the two sides could again be brought across the table.

The British Government is expected to accept the Iranian offer. The decision was to be announced in the House of Commons later in the week. Harriman flew to London from Teheran and over the week end conferred with British Prime Minister Atlee and other cabinet officers.

There was considerable doubt in London as to just how far the Iranians are prepared to go to come to a settlement. Harriman sought to convince the British they should accept the invitation and begin discussions as soon as possible.

Abadan to close down.—Meanwhile, it was announced at Abadan that the 500,000-bbl. daily Anglo-Iranian refinery is scheduled to close down completely this week. The refinery has been progressively reducing throughput since late June when exports were halted as a result of Iranian demands.

Storage at Abadan is now completely full and cannot be moved until the deadlock over nationalization is resolved. Stocks at the refinery were reported at about 6,000,000 bbl. fuel oil, 4,300,000 bbl. gasoline, 340,000 bbl. aviation gasoline, 890,000 bbl. kerosine, 1,430,000 bbl. gas oil, and 1,060,000 bbl. diesel oil.

Only 100 of the British staff at the refinery will be left on a caretaker status, while 350 British employes will continue on the same basis at the field installations. Another 100 of the British staff were evacuated over the week end as a British cruiser maintained watch off the coast.

Normally Anglo-Iranian has about 2,600 British employes at Abadan and in the fields. Dependents were taken out 2 months ago, and most of the British force has been withdrawn since. Those remaining have been subjected to badgering by the Iranian oil "take over" mission, and these activities have prejudiced the British Government against resuming negotiations.

An official of the company at Abadan said that more than 12,000 Iranian workers at Abadan would be made idle by the refinery closing, but that they would remain on the payroll for the time being. A British Embassy official in Teheran said the refinery closing had to be carried out regardless of whether the Iranian offer to resume negotiations is accepted.

Details of the Iranian offer to negotiate, as well as of the Harriman discussions which produced it, were not divulged. The British found the first Iranian invitation too vague and, through their ambassador to Teheran, asked clarification before making any decision on whether to send another mission to talk over the problem with Iranian authorities.

Iran must give.—The British Government is not expected to reopen discussions with the Iranians unless they have some positive indication that Iranian officials are ready to modify their uncompromising stand.

As a sign that the Iranians were ready to negotiate in good faith, the British Government was asking that harassment and interference with the staff at Abadan refinery cease.

There was considerable speculation over the exact nature of the offer which the Iranians made to London as a result of their conferences with Harriman. The first message to London was said to have been intentionally vague. Harriman, who helped draft the proposal, believed that an invitation in the most general terms was more likely to be accepted.

Whether Harriman made promises of substantial American aid to bolster the shaky Iranian economy was not known. Although the primary purpose of his mission was to break the deadlock over the oil question, he also was empowered to discuss broad questions of United States assistance. After several meetings between Harriman and Iranian officials, a more moderate and conciliary tone was apparent in the statements of responsible Iranian leaders.

Speculation rife.—The lack of any definite information on the formula for resuming negotiations gave rise to rumors and speculation. One report said Dr. Mossadegh, the Iranian premier who has spearheaded the drive to take over the Anglo-Iranian properties, has asked for a payment of £20,000,000 or the equivalent of about $56,000,000. It said that Harriman had suggested a joint British - United States-Iranian company which would be in charge of the distribution of Iran's oil production. These reports came from Iranian sources in Teheran.

There is now no argument over the principle of nationalization. This has been conceded by the British and recognized by Harriman. It means that Iran owns the billion-dollar enterprise which the company has built up over the last 40 years in Southwest Iran.

Tanker need.—Walter J. Levy, New York oil economist who accompanied Harriman, apparently has had some success in convincing the Iranians that they stand no chance of being able to ship and market the Anglo-Iranian production unless they have the services of the company's huge tanker fleet. As the optimistic feeling in Teheran increased, various Iranians pointed out that their nationalization law makes no stipulation that the British cannot distribute the oil.

While these high-level government efforts to settle the issue went on last week, tightening oil supply, particularly around the Indian Ocean, testified to the effect of the shutdown of shipments from Abadan. No oil has been exported from Abadan for more than a month.

Loss of the approximately 18,000 bbl. daily aviation-gasoline production at Abadan was curtailing air traffic in such countries as India and Egypt. Bunker supplies were drawn down at many refueling points in southern Asia.

Drastic shortages were being averted by the emergency British purchasing program in this country, stop-gap supply measures including exchanges, and the fact that stocks were built up as far as possible in the weeks preceding the Abadan shutdown. Europe was in a less critical position, partly because of new and reserve refining capacity there.

Fleet redeployed.—Anglo-Iranian's entire tanker fleet of nearly 300 vessels has been fully redeployed, and it is estimated it would take up to 2 months to shift back completely to the former routes and move Iran's production. Black-oil ships were diverted to move crude from other Persian Gulf loading points, while many of the light-oil tankers are now lifting products exports out of the Western Hemisphere.

In industry circles, it has long been recognized that the greatest difficulty in replacing Iran's oil would be encountered within the first few months.

More than a month has already elapsed, and there have been no major disruptions in supply. The chances of completely offsetting the loss seem good, considering the fact that a cooperative program has been worked out by the United States companies operating abroad.

Completely aside from the oil-supply aspects, Britain, however, has other urgent reasons for retaining some degree of interest in Iranian oil. It has been estimated officially by the British that the dollar loss without Iran's oil would be approximately a million dollars a day. This comes at a time when Britain's over-all dollar reserves are again declining.

Israeli Concessions

Government reported to be drafting new oil law

THE Israeli Government is reported to be preparing a new law which will provide for the granting of new oil concessions to foreign companies.

How much interest exists in Israeli's oil prospects is questionable. Persistent reports coming out of Haifa have said Anglo-Iranian Oil Co., Ltd., and unidentified United States companies might take concessions for exploration. Another recent report said Israel planned oil exploration with the aid of Jewish-American capital.

The legislation reportedly being prepared would cancel concessions given by the former British mandate government in Palestine. During the mandate, the concession was held by the Iraq Petroleum Co., Ltd., organization which was drilling one test in southern Palestine but suspended the operation because of political turmoil. It is now reported that I.P.C. has no plans to resume its program and that it is offering the drilling equipment near Huleiqat for sale.

Prospects studied. — Max W. Ball, Washington oil and gas consultant, studied Israel's prospects on behalf of the Government. He said that, except for a few inadequate tests, the country is virgin territory waiting to be tested. The most promising geological provinces, Ball reported, are the Negev, the foothills belt of Judea, the coastal plain, and the Dead Sea-Wadi Araba rift valley.

Israel also hopes for an early return to full operation at the Haifa refinery. This 83,000-bbl.-daily plant is running only at about 15,000-20,000 bbl. daily on account of the crude-oil blockade by the Arab countries. Israel has complained to the Security Council of the United Nations against the Egyptian action in shutting off crude shipments to Israel through the Suez Canal.

Recently, it was indicated that Egypt would relax this prohibition if it had assurances products from the refinery would not be used for aggressive purposes against any Arab country. The Haifa refinery is owned by Anglo-Iranian and Shell, but Standard Oil Co. (N. J.) and Socony-Vacuum also share in its throughput. If the political considerations can be settled, the plant would be a valuable asset in meeting the situation caused by the loss of the Abadan refinery in Iran.

"Queen Mary" Sold

Aramco Buys Huge Barge For Persian Gulf Drilling

ARABIAN AMERICAN OIL CO. has bought the "Queen Mary" diesel-electric drilling barge from Creole Petroleum Corp. and towed the equipment 11,000 miles to the Persian Gulf.

The barge, which was built for Creole in Louisiana and taken to Lake Maracaibo in July 1948, is regarded as the largest and most complete of its kind in the industry. It measures 74 by 172 ft., has a draft of 9 ft., and its electrical equipment provides for several departures from conventional barge-drilling techniques.

Aramco early this year inaugurated offshore drilling in the Persian Gulf with its Safaniya well 13 miles south of Ras el Misha'ab. The well made a discovery in the Bahrein zone, and development drilling is now under way.

Towed by tug.—To move the Queen Mary from Lake Maracaibo, Aramco hired a Dutch tug which went from Africa. The return tow with the barge was made across the Atlantic, through the Mediterranean and Suez Canal, and around the Arabian Peninsula. Time was 72 days from La Salina to Ras Tanura.

The barge arrived in Saudi Arabia May 30 and is to be used in connection with Safaniya 3 for which pile driving was to start this week. The company was driving four pile clusters and using a 136-ft. derrick. Bombay is the nearest dry dock in the area which can accommodate the Queen Mary.

The barge was not put to the extensive use planned for it in Lake Maracaibo. The decline in the Venezuelan industry in early 1949 brought a sharp curtailment in the drilling activities of Creole and most other Venezuelan operators from the high level of activity in 1948.

15,000-ft. range. — The self-contained barge housing the entire power plant and mounting all equipment was considered to have a capacity for drilling depths in the 15,000-ft. range. Only equipment needed on the platform is the draw works, draw-works motor, and rotary-table equipment. It is held in place at the drilling site by four anchors controlled by separate winches.

Three constant-speed diesels developing 750 hp. each at 360 r.p.m. are used as prime movers. A 400-kw., 395-volt variable-voltage d.c. generator is connected to each of the engines to supply draw-works motor, and mud-pump motors, and rotary-table motors. There are four 75-kw. auxiliary generators.

The barge was built by Avondale Marine Ways, Inc., and the electrical equipment was furnished by Westinghouse Electric Corp. Although having somewhat higher operating costs, the barge is considered to have the advantages, among others, of power flexibility, elimination of the feed-water problem, faster bit time, and lessened fuel consumption. A complete description of the barge was published in The Oil and Gas Journal, January 20, 1949, page 80.

Aramco's Safaniya 2 is a land location. This well was last reported unofficially below 4,500 ft., having set 13⅜-in. casing. The depth at which Safaniya 1 is to be completed is expected to be around 5,500 ft.

The company's use of a Dutch tug to take the Queen Mary from Lake Maracaibo is in conformity with its policy of using nondollar services and equipment as far as possible. Aramco seeks to buy as much as possible in the currency areas in which its oil is marketed. At present, the program is being made more difficult by the rearmament effort which is tightening up materials supply in Europe as well as in the United States.

Iraq Oil Deal Nearer

The suit brought in a British court by the Iraq Government against Iraq Petroleum Co., Ltd., to determine if royalties should be paid at the free-market rather than the official gold rate has been adjourned indefinitely in London.

The Iraqi counsel told the court that negotiations now in progress in Baghdad could lead to a settlement of the issue. I.P.C. and Iraqi Government officials have been discussing a new agreement for weeks, and the adjournment of the court case was a further indication that final agreement may be forthcoming soon.

I.P.C. earlier agreed in principle to 50-50 government participation in the company. Reports from Baghdad last week said a sharing of profits, a price for crude oil, and the amount of royalties were among the terms already decided. The question of whether the agreement will also cover Mosul Petroleum Co., Ltd., and Basrah Petroleum Co., Ltd., which are associated with I.P.C., is now being discussed.

The Iraqi minister of economics said earlier this month that the government has accepted the tender of

M. W. Kellogg Co. to build a government-owned refinery south of Baghdad.

The refinery is to have a capacity of 24,000 bbl. daily. Cost of the plant and associated pipe lines is 8 million dinars ($22,500,000). Two million dinars will be convertible for dollar purchases and the remainder spent in the sterling area.

LATIN AMERICA

Venezuelan Congress

Plans are completed for first petroleum convention; more than 300 company, government officials expected to attend

Oscar B. Irizarry

CARACAS, Venezuela. — Preparations have now been completed for Venezuela's first National Petroleum Convention, to be held here September 9-18.

"We have invited more than 400 leading oil executives and government officials from 30 countries, and are preparing for an attendance of more than 300," the writer was told by Dr. Santiago E. Vera, Minister of Mines and Hydrocarbons.

"Although Venezuela is the second largest oil-producing country in the world and the largest oil exporter, this is the first time we have had a technical convention devoted to the Venezuelan petroleum industry. The meeting will be international in importance because Venezuelan oil is refined and consumed in many countries. The convention is a joint operation of the government and the companies, and the ministry has had the fullest cooperation from the companies in preparing the papers and making arrangements for the meeting."

The program for the convention covers the entire range of petroleum operations in Venezuela, the problems encountered and the methods of solution. Its purpose is to acquaint other nations with the Venezuelan industry, both in the over-all view and in details of operation.

Officials and engineers of all oil companies operating in Venezuela are cooperating in plans for the convention. General sessions will be presided over by Dr. Vera and other government officials, but most of the discussions will be conducted by company men.

New feature.—An unusual feature of this convention is that all of the material to be presented at the various sessions has been coordinated into an illustrated book of more than 400 pages, printed in both Spanish and English editions. This book, which is virtually a textbook on Venezuelan oil, will be presented to all registrants at the close of the convention.

With the exception of the chapter on taxes, which was prepared by the Ministry of Mines and Hydrocarbons, the volume is the work of the operating companies. Each chapter represents collaboration of several engineers, and subjects covered are geology, exploration, development, production, transportation, refining, and natural gas. The staff of Petroleo Interamericano, published in Tulsa, Okla., assisted in editing and publishing the two volumes.

Visitors also will be given a second volume, a detailed analysis of Venezuelan crude oils prepared by Prof. W. L. Nelson of the University of Tulsa and technical editor of The Oil and Gas Journal.

Summaries of the material which went into the book will be presented orally at the meeting by the various contributors, and open discussions will follow each paper. Most of the proceedings will be conducted in the Spanish language, with English translation supplied.

Sessions in Caracas will be held on the campus of Andres Bello College. Two days of the convention will be devoted to a visit to the Lake Maracaibo oil fields and the refineries on the Paraguana Peninsula. Airlines reaching Venezuela from the United States and Europe are planning special arrangements to transport visitors to and from the meeting.

Soon to Carry Crude Oil

The pipe filling this yard at Homs, Syria, will soon be a part of the 560-mile, 30-in. crude line of Iraq Petroleum Co. from Kirkuk, Iraq, to Banias, Syria. Last month more than 400 miles of pipe had been shipped for the line. Preliminary construction first began last September. (I.P.C. photograph by A. R. Tanner.)

Break for Bolivia

United States recognition paves way for oil program

RECENT United States recognition of the new regime in Bolivia will make way for resumption of efforts of Bolivian oil officials to work out a new industry program with United States assistance.

Bolivia's oil is controlled by the state agency, Yacimientos Petroliferos Fiscales Bolivianos. Two refineries were completed last year with Export-Import Bank assistance, but total domestic production is considerably below the new processing capacity.

To remedy this, Bolivian oil officials have been seeking to interest private United States companies in some form of mixed-company operations, or in operations on their own account in the northern part of the country.

Loan negotiations.—For further work at Camiri and Guayruy, Bolivia is negotiating for an additional $3,000-000 Export-Import Bank loan which would be used to contract a United States drilling firm. Camiri is the

country's main source of crude and is connected by pipe line to the refineries at Cochabamba and Sucre.

The Bolivian program also calls for a contract with a United States company to operate the new Cochabamba refinery. Williams Brothers now operates the Bolivian pipe-line system which it built several years ago.

The negotiations for the new Export-Import Bank loan were suspended after the overthrow of the government in La Paz. With United States recognition of the new group, they presumably now will be resumed.

$50,000,000 sought.—A report from La Paz said that Bolivia hopes to attract $50,000,000 in foreign capital, which would increase petroleum production sufficiently to meet all local needs and allow refined products to be exported to neighboring countries. United States private companies have shown little interest in the invitation to operate in Bolivia, although a recent unconfirmed report originating in Mexico City said Union Oil Co. of California has been holding discussions with the Bolivians.

Production dropping.—Camiri production has continued to fall in recent months. The output of this field, practically the sole source of crude in the country, was 981 bbl. daily in March and, because of labor difficulties, may have been even lower in April.

The government recently authorized a 30 per cent wage increase for oil workers in Bolivia. Simultaneously it allowed increases in the price of motor fuel of two bolivianos per liter and in the price of kerosine of 0.50 centavo per liter.

Wildcat Planned

Manabi will drill test on Engunga prospect, Ecuador

MANABI EXPLORATION CO., INC., is making plans to commence its first wildcat test on its original acreage in Ecuador early this fall.

The well will be drilled on the Engunga prospect to the south of the present producing areas on Santa Elena Peninsula. The company has done gravity work in the area, and at present is continuing geological work in the field.

Manabi is now the only American oil interest in Ecuador. It began taking out concessions early in 1949 and early this year completed the purchase of properties of Ecuador Oilfields, Ltd., the smaller of the two British companies operating in the country *(The Oil and Gas Journal, December 21, page 270)*.

Drilling on the El Tigre field holdings which were among the properties acquired from Ecuador Oilfields, Manabi recently brought in two field wells, good for about 300 and 400 bbl. daily. Cecil V. Hagen, president of Manabi, said present production is about 1,800 bbl. daily. This represents an increase of 40 per cent since the operation was taken over.

Manabi has signed a 2-year contract with Shell which will take the 1,000 bbl. daily or so of the company's production which is available for export. Ecuador's oil is the only production on the West Coast between Peru and Los Angeles, and it is understood Shell will move the Ecuadorean crude to its refinery at Vancouver in British Columbia.

Field plant planned.—Another development in the company's program is the construction of a 4,000,000-cu. ft. daily capacity gasoline absorption plant, work on which is to start in the next 3 months. Frank West, consulting engineer of Fullerton, Calif., has made the survey for the plant. The natural gasoline produced will be used as blending stock at the 700-bbl. daily topping plant which Manabi acquired from Ecuador Oilfields.

As a result of this use of lighter fractions, the topping plant's production of gasoline, which now is about 20 per cent of its output, will be increased by some 50 per cent. Products from the topping plant are sold by Manabi to bulk buyers, among them Anglo-Ecuadorean Oilfields, Ltd., the major Ecuadorean company.

Current operations.—Manabi has five rigs in Ecuador, including one National 50 which was bought from Shell when the eastern Ecuador exploration program this company carried out with Standard Oil Co. (N. J.) was abandoned a year and a half ago. A Cardwell unit will be used on an extension well, Matilde 1, which Manabi plans to commence in the next 30 days in the Tigre area about 4 miles northwest of the present producing area. Two steam rigs will be used to continue development drilling in El Tigre field itself.

The Engunga wildcat, the company's first test on the concessions which it acquired directly from the government, is in the same general area as one of the unsuccessful wells drilled by International Petroleum Co., Ltd., before it discontinued a program of exploration in the coastal section of the country in 1947.

Ownership.—Manabi is a 50 per cent affiliate of Canada Southern Oils, Ltd., a Canadian corporation. Hagen, a consulting geologist with headquarters in Houston and New York, also is president of Canada Southern. The other 50 per cent of Manabi is held by individual oil men in the Southwest and in New York. The stock of Canada Southern, which also owns Albercan Oil Corp., operating in Canada, was recently distributed to holders of Pancoastal Oil Co. shares in a reorganization of the latter company.

CIMA to Get Extra Rig

Petroleos Mexicanos has agreed to provide Mexican-American Independent Oil Co. with another drilling rig to step up development of the company's newly discovered Rabon Grande structure in Veracruz.

The rig, to be either rented or leased, will be used for 3 Rabon Grande, while the company's rig will drill the No. 2 well.

The discovery well is now shut in awaiting completion of pipe-line outlet. CIMA operates on a percentage-of-production contract with Pemex.

EUROPE

New Units Added

Trieste refinery puts new facilities into operation

THE Aquila refinery at Trieste has placed in operation new units for the production of lubricating oils and for the improvement of its motor-fuel output.

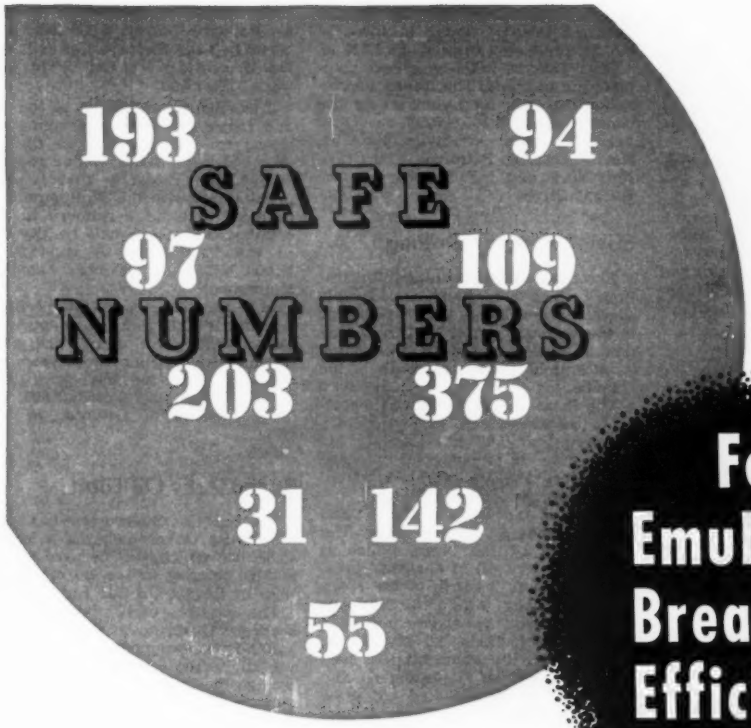
The lubricating-oil facilities consist of propane deasphalting, furfural solvent refining, M.E.K. dewaxing, contact filtration machinery, and fully automatic blending equipment. Estimated annual production will be about 30,000 tons of 95 V.I. lubes and bright stocks and 8,000,000 lb. of paraffin waxes.

Aquila has started on the installation of equipment for manufacturing high-melting-point paraffin wax and of microcrystalline paraffin wax. The latter has not hitherto been produced in Italy.

The other units recently placed on stream consist of a reformer and light-ends fractionation. The reformer has the capacity to produce 350 tons of high-octane gasoline daily. It was supplied by Universal Oil Products.

The new equipment *(The Oil and Gas Journal, September 14, 1950, page 76)* was financed to about half its cost by the Economic Cooperation Administration. Aquila was the first European refinery to receive ECA assistance. The plant operates on Middle East crude and now has an annual capacity of 600,000 tons. It was almost completely destroyed during the war but reconstructed and reopened in June 1947.

Across northern Italy at Milan, construction work is going forward on the new 1,300,000-ton annually refinery to be built by Condor, S.p.A. per l'Industria Petrolifera e Chimica. It was announced recently that it is expected this new addition to Italian



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refining capacity will be in full operation by the end of next year.

The refinery is connected with the central port of Genoa by a 135-km. pipe line 12 in. in diameter. Purchase of materials for this line and the tank farm at Fegino (Genoa) is almost complete.

Petrocarbon, Ltd., a British firm, is acting as consultant to Condor and is responsible for a large part of the design and planning for the project. The refinery will comprise atmospheric distillation with a 30,000-bbl. daily throughput, catalytic cracking of 15,000 bbl. daily capacity, gas-recovery units, and treating and auxiliary equipment.

Gas Found in Emsland

Natural gas in economic quantities has been discovered in a well drilled by German interests north of Nordhorn near the German-Dutch border in the Emsland area.

The well is Frenswegen 1 which was drilled by Wintershall A.G., on a joint concession of C. Deilmann, Gewerkschaft Elwerath, Preussag, and Wintershall.

The gas formation, found at a depth of 6,316 ft., is the Plate dolomite of Zechstein, which is the same as that in the natural-gas field of Bentheim situated farther to the south. A gas pressure of 150 atmospheres was measured in the Frenswegen hole, and the operators, at last reports, were carrying out production tests.

The Frenswegen discovery appears to be related to the Itterbeck well about 15 km. southwest of Georgsdorf. This well was brought in as a gas producer some time ago. The gas is considered of value particularly as a possible supply for the repressuring of Georgsdorf field.

New Producers Reported

Azienda General Italiana Petroli, the Italian state oil company, is reported to now have three commercially producing oil wells in the Cortemaggiore field of northern Italy.

First indications of oil were found in Cortemaggiore more than 2 years ago. It raised considerable excitement both in Italy and abroad, but subsequent development found largely gas and condensate.

The oil wells are understood to all be in the eastern part of the field with the light crude coming from a separate sand, the Tortonian (Miocene). The oil-producing wells are Nos. 1, 28, and 29.

No. 28 produced nearly 200 bbl. of oil along with about 48 bbl. of water on a 4-mm. choke with no gas from a depth of 1,728 m. The flow was by surges. There was reported to be some 4 m. of producing sand.

The No. 1 well has been flowed at rates from 120 to nearly 160 bbl. daily. It is reported that this well was not produced until only recently. No. 29 obtained results similar to those in No. 28, producing from about 1,900 m.

More than 30 wells have been completed in the field. The Italian organization last year let a contract for the construction of a 100,000,000-cu. ft. capacity gasoline-extraction plant to North American Petroleum Gas Corp., New York, and J. F. Pritchard & Co., Kansas City.

Soviet Extends Drilling

The Soviet Mineral Oil Administration, which has had considerable success in developing the Matzen area in the Vienna basin of Northeast Austria, is now reported to be turning its attention to the area south of the Danube.

The Russian organization is reported to be planning to drill to depths of more than 700 m. (2,300 ft.) in this region. It is not clear whether this refers to core work or actual exploratory drilling operations.

South of the Danube the Vienna basin extends 20 km. or more. The larger part of the basin, which is the location for all of Austria's present production, is north of the river.

As at Matzen, where the Russians are understood to have developed production of 20,000 to 25,000 bbl. daily, the Soviet organization is basing its exploration on geological and other survey work carried out prior to the war by the large international companies which had permits in the area. Exploration was also carried out by German companies which controlled the area during the war. There is no production south of the Danube at present except for some natural gas in the vicinity of Vienna.

FAR EAST

New Refinery

20,000-bbl. plant planned by Caltex for Australia

CONSTRUCTION of a new refinery of a capacity of 20,000 bbl. daily or more in Australia is planned by the Caltex organization.

The company's Australian affiliate announced in Sydney that it had made application for the project to appropriate government authorities. It said various locations for the plant are being studied.

The company's announcement in Australia said it was estimated the refinery would cost around 25,000,000 Australian pounds. This sum is equivalent to about $55,000,000, and it indicated Caltex is planning a completely modern plant with the 20,000 bbl. daily capacity a minimum figure.

Caltex now holds a minority interest in and supplies crude to Bitumen & Oil Refineries (Australia), Ltd., an Australian company which operates a refinery of about 6,000 bbl. daily capacity near Sydney. Caltex's Australian subsidiary is Caltex Oil (Australia) Pty., Ltd.

The Australian project is the second major refining undertaking disclosed for the company in the Far East in recent weeks. Caltex recently announced in Manila that it is in negotiations with the Philippine Government to build a refinery in that country. The plant will be the first in the Philippines. A capacity of 16,000 bbl. daily or more has been mentioned.

In Australia, present total refining capacity in four plants now aggregate about 18,000 bbl. daily. The Shell organization earlier this year announced plans for the construction of a refinery of about 22,000 bbl. daily capacity at Geelong, in Victoria.

Burma Asks Oil Loan

The Burmese Government has asked the British Government for a loan of £5,000,000 which will be used to buy a third interest in the Burma operations of Burma Oil Co., Ltd.

The company earlier had given the Burmese Government the outline of a plan for government participation in a local Burma company. The aim of both the government and B.O.C. is the reconstruction of the industry and stepping up production and refining.

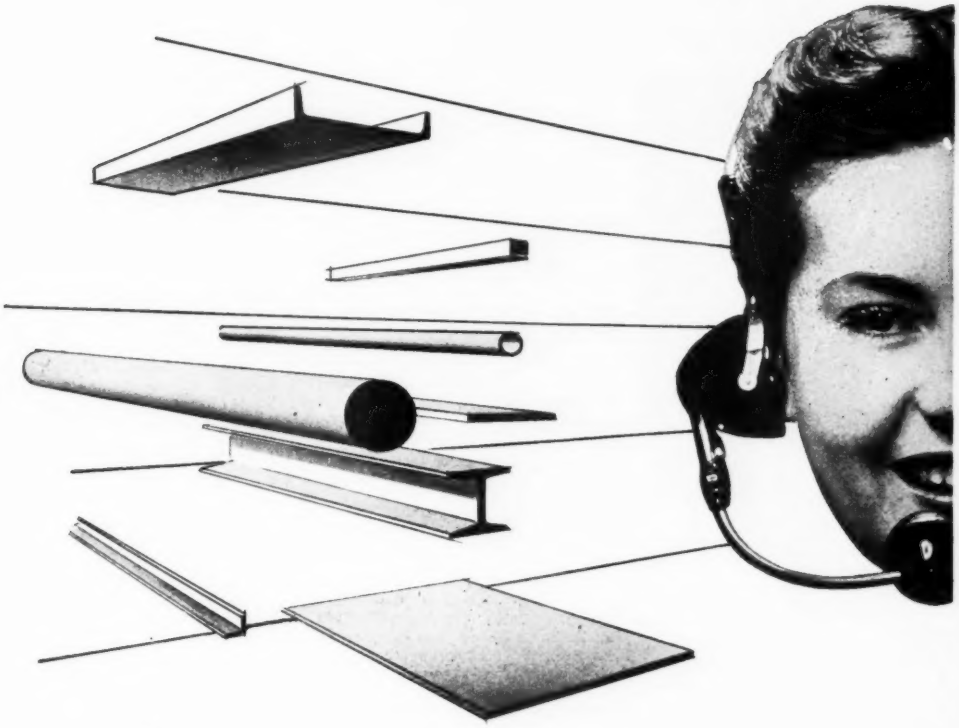
W. E. V. Abraham, B.O.C. managing director, arrived recently in Rangoon for discussions with Burmese officials. Civil war has for 5 years prevented rehabilitation of the war-damaged oil industry in Burma. In his recent annual statement, Sir Kenneth B. Harper, chairman of the company, pointed out that there has been a marked improvement in internal communications in Burma and in the country's finances. However, he said that in the state of security now existing and in sight, repair of the main Rangoon pipe line can still not be contemplated, and there is therefore no case for rebuilding the main Syriam refinery.

Showa, Shell Enter Agreement

Japan's Showa Oil Co. has entered into a financial and oil-supply tieup with the Shell organization, according to a report from Tokyo.

A 5-year contract recently signed by the two companies provides for the supply of crude oil by Shell and the receipt by Shell's Japanese subsidiary of products from the Showa company.

It has also been agreed that Shell will give financial assistance to Showa as and when necessary, and will take 3,000,000 shares of the company's stock at a cost of 150 million yen. This represents 15 per cent of the Japanese company's capitalization.



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PERSONALS

In New Job

Wingrove heads operating section of Socony plant

BYRON F. WINGROVE, who was recently named superintendent of the operating department at Socony-Vacuum Oil Co., Inc.'s, Paulsboro, N. J. refinery, has taken over his new duties. In his new management position, Wingrove will rely on a thorough background in processing which he gained while serving with Magnolia Petroleum Co. in Beaumont, Tex.

Born in Tucumcari, N. M., he attended New Mexico State College of Agricultural and Mechanical Arts and received a B.S. degree in chemical engineering in 1935. Before graduation he served as assistant to the New Mexico state chemist. Following a year's experience as field engineer with the State Highway Department, he left New Mexico to become an analytical chemist with Pure Oil Co. at the Smiths Bluff refinery.

He joined Magnolia in January 1938 as a process engineer and progressed to chief process engineer before his transfer to Paulsboro in 1949 as assistant superintendent of the lubricating-oil division of the operating department. He held this position until his present promotion on July 1.

As operating chief under General Manager E. L. Sinclair, he succeeds R. M. Chesney, who is now manager of the Deep Rock Oil Corp. refinery at Cushing, Okla.

George R. Thompson, of Standard Oil Co. (Ohio), has been promoted from foreman of the cracking department to the newly created post of assistant general superintendent of No. 1 refinery, Cleveland.

Robert L. Littlejohn, petroleum engineer for Terminal Drilling Co. for the past 14 years, has resigned from the firm to open consulting offices in Los Angeles.

Ted Lee, geologist for Sunray Oil Corp. at Los Angeles, has been transferred to Calgary, Canada.

Russell M. Perkins, district manager of Union Gas Co. of Canada at Windsor, has been elected president of the Canadian Gas Association, succeeding **Hugh Smith,** secretary of Consumers Gas, Toronto.

Bowman R. Waters, drilling superintendent for Burt Drilling Co., has been transferred from Coleman to Abilene, Tex.

R. W. Bond, regional director of production for Shell Oil Co. at Houston, has been transferred to New York as manager of production for Shell. **F. A. Nelson,** supervisor of activities at the firm's regional exploration staff at Houston, has been transferred to New York as manager of exploration for the firm. Bond and Nelson will assist **A. J. Galloway,** vice president in charge of all exploration and production activities. Bond has been with the firm for the past 25 years, and Nelson has been with Shell since 1929.

Leigh S. McCaslin, Jr., formerly Gulf Coast district editor of The Oil and Gas Journal, has joined the marketing division of Deep Rock Oil Corp., Tulsa. Prior to joining the Journal in 1947, McCaslin was an engineer in the production department of Phillips Petroleum Co. He graduated from Oklahoma A. & M. College in 1942 and served in the Army until 1946.

William G. Taylor, divisional purchasing agent for The Texas Co. in Chicago, has been promoted to assistant manager of the firm's purchasing department. He joined Texaco in 1922 as a hall boy in the New York offices.

Louis T. Moffatt, engineer for Sunray Oil Corp., has been transferred from Tulsa to Barnsdall, Okla.

L. V. Fees, consulting geologist, has moved his offices from Denver to Sidney, Neb.

Charles M. Ellenberger has been appointed district superintendent of the Armstrong district for New York State Natural Gas Corp.

Page Hufty has been elected a director of North Central Texas Oil Co., Inc., replacing **Augustus C. Smith,** who has resigned.

M. W. Morris, toolpusher for Magnolia Petroleum Co., has been transferred from Ozana to Odessa, Tex.

A. F. HOEHLE

Armand F. Hoehle has been appointed assistant general superintendent of distribution for Equitable Gas Co., Pittsburgh, succeeding **Earl E. Keeler,** who retired July 1. Hoehle joined the firm in 1926 after graduating from Pittsburgh School of Mines. Starting as a cadet engineer, he worked up the ranks, and was named assistant to the general superintendent of distribution last March.

O. W. Mitchell, petroleum engineer for Sinclair Oil & Gas Co., has been transferred from Abilene to Midland, Tex.

V. A. Cain, formerly production foreman for Kemp Drilling Co. at Winters, Tex., has opened offices at Midland, Tex., as an independent operator.

H. G. Van Horn, reservoir engineer for Shell Oil Co., has been transferred from Houston to Corpus Christi, Tex., as exploitation engineer.

C. N. Hunt, Jr., assistant district superintendent for Humble Oil & Refining Co., has been transferred from Pickton, Tex., to Talco, Tex.

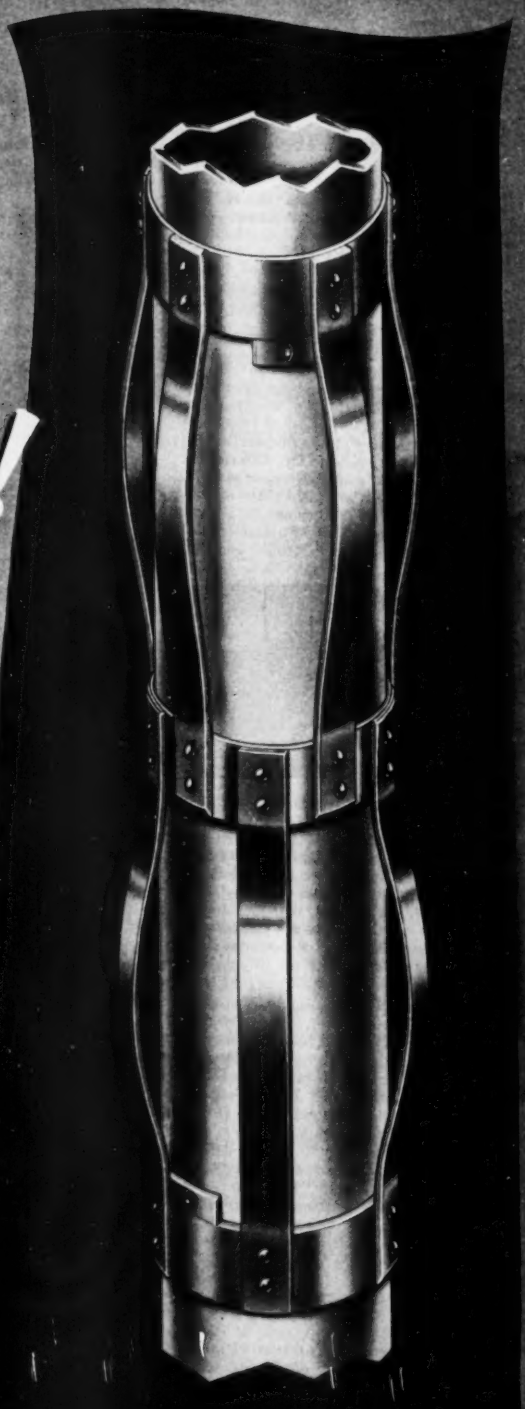
Floyd C. Priest, junior petroleum engineer for Stanolind Oil & Gas Co. at High Island, Tex., has joined Superior Oil Co. at Sinton, Tex., as mud engineer.

Don A. Miller has been placed in charge of Phillips Petroleum Co.'s new West Texas-New Mexico regional offices at Midland, Tex. With Phillips for the last 17 years, he was western division manager before assuming his new post.

Warner E. Life, Panola district production engineer for Skelly Oil Co. at Carthage, Tex., has been transferred to Shreveport as petroleum engineer for the Ark-La-Tex district.

Paul Sheffstall, assistant division superintendent for petroleum of Sohio Petroleum Co., has been placed in charge of the new production office at Midland, Tex. **C. W. Aikman** is the

FOR ONE JOB *well done!*



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PERSONALS

office manager and also is in charge of materials. Assistant foremen are: **Thurman Reynolds, Ralph Lawrence, Claude Edmondson,** and **O. H. McLaughlin. Harve Higgenbotham** is engineer for the new department, and **Fred Davis** is field man.

William K. Sheldon, formerly with Ohio Oil Co., has joined Sunray Oil Corp.'s geological department in the San Antonio district.

Dr. W. J. Coppoc has been promoted to associate director of research in The Texas Co.'s technical and research division with headquarters in the New York office. **Dr. Charles E. Moser** has been named to succeed Dr. Coppoc as assistant director of research at the firm's Beacon, N. Y., research laboratories. Dr. Coppoc joined Texaco as a chemist in 1938, and resigned 2 months later to return to college. He rejoined the firm in May 1939 after receiving a Ph.D. from Rice Institute, and was transferred to Beacon in 1947. Dr. Moser, who has been supervisor of the fuels-development-research department at Beacon, joined the firm in 1939.

DR. W. J. COPPOC

DR. C. E. MOSER

Chester L. Doyle, senior petroleum engineer at General Petroleum Corp.'s San Joaquin, Calif., offices, has been advanced to assistant chief petroleum engineer in the exploration department at Vernon, Calif. Doyle joined the firm in 1939 after graduation from University of California.

R. L. Rist has been named district geologist for Jergins Oil Co. at Bakersfield, Calif., succeeding the late H. A. Campbell. For the past 13 years Rist was with Standard Oil Co. of California.

G. L. Jemmott, exploitation engineer for Shell Oil Co. at Bakersfield, Calif., has been transferred to the coastal division at Ventura, Calif. Other recent Shell transfers include **R. M. Jorda,** mechanical engineer, from Los Angeles to Bakersfield; **J. W. McEver,** mechanical engineer, from Ventura to Casper, Wyo.; and **J. W. Speer,** mechanical engineer, from Bakersfield to Long Beach.

William B. Jones, Norman, Okla., has joined Phillips Petroleum Co. at Oklahoma City as geologist.

Maynard I. Landa has been appointed associate petroleum - economics coordinator of Cities Service Co. He joined the firm in 1919, and was later assigned to the oil-production department as an engineer. In 1923 he became assistant to the manager of oil production at the firm's headquarters for operations in the Mid-Continent field in Bartlesville, Okla. In 1925 he was transferred to the New York headquarters to make special analyses studies of petroleum operations, and in 1941 he became manager of the petroleum-economics and statistics department handling these studies.

Roger F. VanZytveld and **Dan R. Crocker,** project engineers in Socony-Vacuum Oil Co.'s refinery-engineering department at New York, have been transferred to the company refinery at Bremen, Germany.

Sam Cohen, geologist with Globe Oil & Refining Co., has been transferred from Calgary, Alta., to Oklahoma City.

Herbert K. King, of Miami, Okla., has joined Carter Oil Co. at Oklahoma City as geologist.

Frank Earl Eckert, Jr., petroleum engineer for Gulf Refining Co. at Triumph, La., has been transferred to Harvey, La.

Roy M. Teel has been appointed assistant to the manager, **George P. Bunn,** of Phillips Petroleum Co.'s natural gasoline department. **H. R. Legatski,** who has been superintendent of operations, has been named project development engineer for Phillips Chemical Society, a subsidiary of Phillips. In this newly created job Legatski will evaluate the technical aspects of projects for the company. **Louis P. Sumpter** succeeds Legatski as superintendent of operations. Other Shell changes include: **W. L. Culbertson** appointed chief engineer in charge of the engineering division, succeeding Teel; **C. R. Ringham** appointed director of the section of coordination and analysis of the engineering division succeeding Culbertson; **L. H. Moore** appointed superintendent of the division of contracts and settlements, with **R. H. Clark** to direct the settlement section; **H. R. Markley** named assistant to Sumpter in charge of plant operations; and **W. L. Phillips** appointed western district superintendent at Odessa, Tex., to succeed Markley.

James A. McAleer, project engineer with Socony-Vacuum Oil Co., Inc., has returned to the firm's refinery-engineering department at New York, after serving a year in France.

DR. P. C. WHITE

Dr. P. C. White has been appointed manager of research and development for Pan American Refining Corp. effective August 1. He will make his headquarters at firm's main research laboratories in Texas City, Tex. Dr. White formerly was division director of the fuels and special products division at the Whiting laboratory of Standard Oil Co. (Ind.). Two promotions in the research staff at Texas City have been announced by Pan American. **M. C. Hopkins,** previously coordinator of research and development, on August 1, assumed the duties of technical director, in charge of all phases of chemical engineering work. **Dr. J. E. Kasch** advances from assistant director to associate director, working directly under Hopkins. Kasch will be in charge of process development, process design and economics. Hopkins has been with the firm since 1937 and Kasch since 1942.

T. H. Brighton, until recently manager of California Research Corp.'s El Segundo laboratory, has been transferred to California Research & Development Co. at Livermore, Calif. **G. W. Stroebe** is the new manager of California Research, while **W. S. Svenson** has been advanced to Stroebe's former position of assistant manager.

Bland Bounds, of Phillips Petroleum Co., has been elected president of the Indiana-Kentucky Geological Society. **Ken Lewis,** of W. C. McBride, Inc., has been elected vice president; and **William Pelley,** of Sinclair Oil & Gas Co., was elected secretary-treasurer.

W. C. Chonette, formerly manager of Shell Oil Co.'s Los Angeles Basin division, Long Beach, Calif., has been transferred as chief exploitation engineer to the Los Angeles regional offices. Trading jobs with Chonette is **Bert P. Eastin. J. E. Gallagher,** formerly division mechanical engineer at Bakersfield, Calif., has been advanced to superintendent of the San Joaquin, Calif., division.

PERSONALS

Harry A. Larsh, geologist for Shell Oil Co., has been transferred from Houston to Tyler, Tex.

F. J. Stephens has been appointed managing director of Anglo-Saxon Petroleum Co., Ltd., Shell Petroleum Co., Ltd., and a delegate member of the board of N. V. de Bataafsche Petroleum Mij., The Hague, which are the three principal operating companies of Royal Dutch-Shell Group. He succeeds **Sir George Legh-Jones,** who has retired.

Forrest Gus Prutzman, Dallas, has been appointed to the newly created position of assistant chief petroleum engineer in Sun Oil Co.'s Southwest division.

Ralph S. Cooley, formerly manager of the West Texas-New Mexico operations for Sharples Oil Corp., has joined **Joseph I. O'Neill, Jr.,** of Midland, Tex., as head of exploration.

Cecil V. Hagen has been elected president of the new firm, Canada Southern Oils, Ltd., which has taken over the Canadian and Ecuadorian interests of Pancoastal Oil Co., C.A. A veteran of 21 years in the oil industry, Hagen was formerly chief geologist in charge of exploration for Superior Oil Co. of California, and now operates his own geological consulting firm, Cecil Hagen and Associates, at Houston. He has been closely associated with oil-development work in Western Canada for the past 2 years as chief geological consultant to Albercan Oil Corp., a Canada Southern subsidiary. In 1948 he founded Manabi Exploration Co., Inc., which operates producing properties and concessions in Ecuador.

R. F. Childs, formerly production superintendent at Taft, Calif., for Standard Oil Co. of California, has been appointed technical superintendent of the firm's natural-gasoline department. **W. H. Whimpey** succeeds him at Taft.

J. W. Alexander, independent oil operator, has opened an office at Denver. For the past several years he has been operating at Albuquerque, N. M.

M. D. Abel has resigned as district engineer for Plymouth Oil Co., and has joined BBM Drilling Co. as chief engineer with headquarters in Midland, Tex. **Neal Taylor** is now serving as acting district engineer for Plymouth. **Wendell Cook,** at Plymouth's Benedum gasoline plant, Upton County, Texas, has been transferred to Susan Peak field in Tom Green County, Texas, where he will work in the firm's engineering department on repressuring and gas-lift problems.

Charles N. Kimberlin, Jr., has been appointed senior research associate at Esso Standard Oil Co.'s Baton Rouge, La., laboratories. With the firm since 1933, his achievements have been in the fields of chemical and petroleum research leading to the development of new catalysts and to the development of improved processes for the conversion of petroleum raw materials to more valuable products.

Ewel E. Vaughan, petroleum engineer for British-American Oil Producing Co., has been transferred from Oklahoma City to Grayville, Ill.

L. M. Cochran, formerly superintendent for Great Lakes Refining Co. at Blue Island, Ill., has joined Uinta Oil Refining Co., Vernal, Utah, as superintendent.

Walter E. Hallgarth, of the University of Tulsa; **Sherwood E. Frezon,** University of Michigan; and **Ernest E. Glick,** University of Illinois, are recent additions to the Tulsa office of the fuels branch, U. S. Geological Survey.

Ben F. Hartman, who has been project engineer at Socony-Vacuum Oil Co.'s Augusta, Kans., refinery since 1937, has been transferred to the process development department at the firm's home office in New York.

E. A. McCullough has resigned as district geologist and manager of exploration in the Permian Basin for Sunray Oil Corp., and has opened offices in Midland, Tex., as a consulting geologist and independent oil operator and trader. **Clarence Symes, Jr.,** who has been a member of Sunray's geological staff at Midland, has been named district geologist, and **Carl E. Davis** has been named head of the firm's Permian Basin district land department. McCullough joined Sunray 5 years ago when the firm opened its geological and exploration office at Midland, and had been headman until his resignation. Prior to joining Sunray he had worked in the district geological office of Phillips Petroleum Co. in Midland for 5 years.

Dr. Gordon Rittenhouse, formerly associate professor of geology at University of Cincinnati, has joined Shell Oil Co.'s exploration department at Tulsa as geologist handling special problems.

Carl A. Morrison, formerly general manager of Producers Pipe Line Co., has opened offices at Owensboro, Ky., as an independent oil producer. **George P. Ellison** is the new manager for Producers at Owensboro.

R. H. Parks, production engineer for Texas Gulf Producing Co., has been transferred from Midland, Tex., to Houston.

Lou Tuck, drilling superintendent in charge of the Rocky Mountain area for Will I. Lewis Drilling Co., has been transferred from Mount Vernon, Ill., to Casper, Wyo.

DEATHS

Clarence Clay Clifton, 61, retired division superintendent for Humble Oil & Refining Co., died July 29 at New Orleans. He had been employed by the Humble firm since its formation.

E. E. Brown, former partner in Manning & Brown Drilling Co. of Denver, died there on July 21. He had retired from active drilling operations in 1945.

William C. Johnson, executive vice president of Allis-Chalmers Manufacturing Co., died July 26 at Milwaukee. He had been with the firm since 1924.

Robert S. Hyer, Jr., 59, field superintendent for Sperry-Sun Well Surveying Co., died July 20 in Galveston, Tex. He had been with the firm for 20 years.

William H. Gibson, 62, superintendent of terminals at Nashville for Pan-Am Southern Corp., died recently.

Wilton C. Emrich, 62, Wichita, Kans., oil operator, died of a heart attack July 16.

James L. Byrnes, 70, formerly with United Natural Gas Co., died July 22 at Limestone, Pa. He retired 1 year ago after 48 years of service with United Natural.

Arthur M. Wilson, 51, research chemist for Esso Standard Oil Co., died July 22 at Sussex, N. J. He had been with the firm for 22 years.

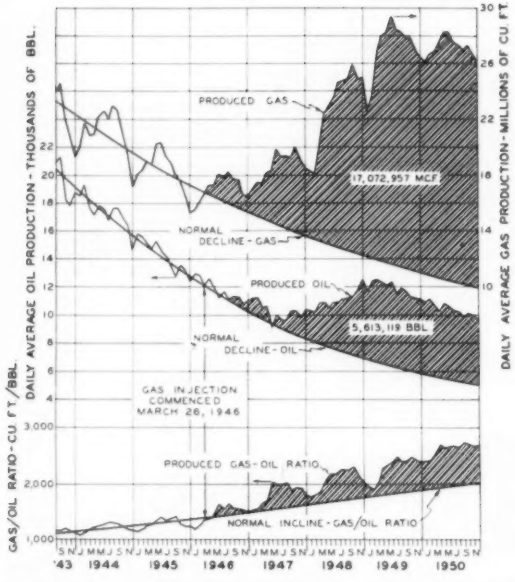

GAS/OIL RATIO - CU FT/BBL.
DAILY AVERAGE OIL PRODUCTION - THOUSANDS OF BBL.
DAILY AVERAGE GAS PRODUCTION - MILLIONS OF CU FT
PRODUCED GAS
17,072,957 MCF.
NORMAL DECLINE - GAS
PRODUCED OIL
5,613,119 BBL.
NORMAL DECLINE - OIL
GAS INJECTION COMMENCED MARCH 26, 1946
PRODUCED GAS-OIL RATIO
NORMAL INCLINE - GAS/OIL RATIO
'43 1944 1945 1946 1947 1948 1949 1950

Fig. 1—Oil and gas production data, Panhandle field, Gray County, Texas.

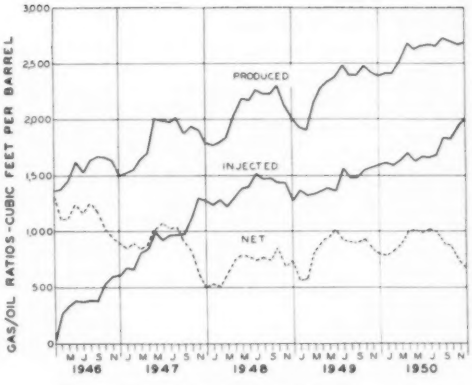


Fig. 2—Gas-oil ratios, produced, injected, and net.

More than 25 billion cubic feet of gas injected into 162 input wells, with the liquid hydrocarbons extracted from increased gas production more than paying operating costs are among results of

Five Years of Gas Injection

by Fred J. Neslage

FIVE years of gas injection were completed in the West Pampa Repressuring Association area in March 1951, and as of this month, 25,061,908 M.c.f. of gas had been injected in the 162 input wells. During 1950 the number of producing wells decreased from 865 to 851 as a result of converting 25 additional wells to input duty, returning 4 of the original injection wells to producing wells, and drilling 7 new wells. The liquid hydrocarbons extracted from the increased gas production alone are more than paying for the cost of operating the project.

At the present time there is an input-well density of one per 73 acres or one per 5.3 producing wells. No particular change in input-well density is anticipated during 1951, and future increases will be, for the most part, from wells that have reached their economic limits but are located in areas that would benefit from additional input wells.

There are still some producing wells in the project that are not direct or diagonal offsets to an injection well, and past experience indicates that in all probability these wells are not receiving peak benefits from the injection program. This condition gradually will be eliminated as additional wells are converted to input duty. Since the start of the project a policy of injecting a moderate volume of gas in as many wells as possible has been followed rather than injecting a large volume of gas into a few wells. By continuing this policy a more uniform distribution of the injected gas is assured and the possibilities of so-called "channeling" or "bypassing" are held to a minimum.

During the past 2 years the rate of gas injection has been gradually increased from 17,500 to 20,000 M.c.f. per day as more input wells were put in service. This is a rate of 124 M.c.f. per day per input well or approximately the same as injected last year. Injection rates were also increased on a few wells where the well spacing was not on a regular 10-acre pattern, but these cases were held to a minimum.

No operating difficulties of any consequence were experienced at the repressure plants and no freezeups were encountered in the field distribution system. During the last half of 1950 the field system was expanded by adding 23 additional meter loops.

Field Processing Plants

High-pressure gas for injection is supplied by two repressure plants built in conjunction with modern high-pressure absorption-type gasoline plants. The first plant, completed in the spring of 1946, is designed to deliver 18,000 M.c.f. per day, while the second plant, completed in May 1949, is designed to deliver 12,000 M.c.f. per day. The two plants together are capable of delivering 30,000 M.c.f. of gas per day to the field repressure system and maintain a minimum pressure of 450 psi. Gas entering the field system is processed at the repressure plants so as to have a dew point of —20° F. and a hydrogen sulfide content of less than ¼ grain per hundred standard feet.

Initially the first plant furnished all of the gas for the entire project, but upon completion of the second plant, the field was divided so that the first one serves the north and the second one serves the south end of the field. In the event that one plant is shut down temporarily for repairs it is possible to open a block gate so that either plant can serve the entire area.

At both plants, incoming wet gas passes from the first stage of compression to the desulfurization unit and through two more stages of compression to the absorber. Residue gas

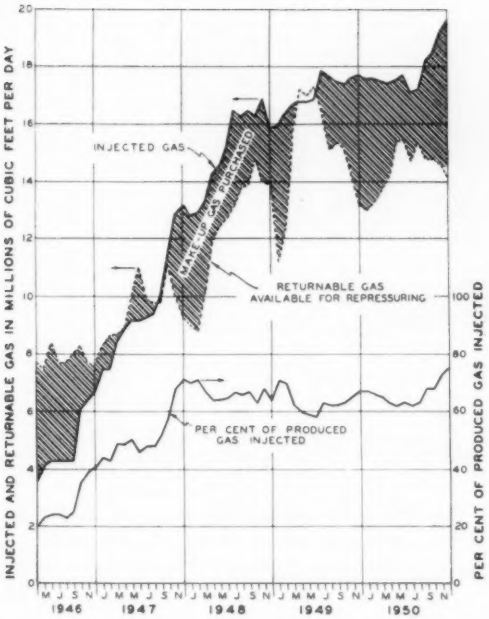

INJECTED AND RETURNABLE GAS IN MILLIONS OF CUBIC FEET PER DAY
PER CENT OF PRODUCED GAS INJECTED
INJECTED GAS
CARTER OIL'S PRODUCTION
RETURNABLE GAS AVAILABLE FOR REPRESSURING
PER CENT OF PRODUCED GAS INJECTED
M J S N J M M J S N J M M J S N J M M J S N J M M J S N
1946
1947
1948
1949
1950

Fig. 3—Gas-injection data.

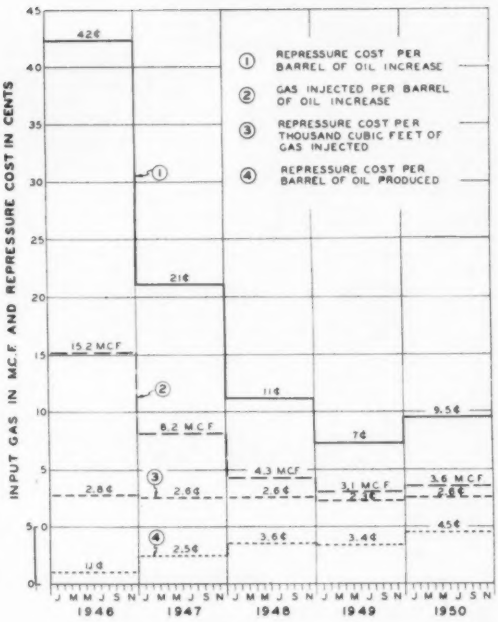


Fig. 4—Cost data on operation.

leaves the absorber at approximately 500-520 psi., at which point it is passed through the dehydration unit and then into the field system and on to the injection wells. Gas injected into each input well is measured individually.

Dehydration units at each plant are of the dry-pack type. At the first plant floride desiccant is used as the drying agent while at the second plant activated alumina is used. Both units operate very satisfactorily.

The hydrogen sulfide treaters at both plants use monoethanolimine. Treatment of the gas for removal of hydrogen sulfide at the first stage of compression provides sweet gas for handling through the second and third stages of compression and absorption, thereby substantially reducing corrosion of the plant equipment and field distributing system as well as supplying sweet gas for injection.

All of the available gas after extraction loss, plant fuel, and lease fuel, is being injected. Currently the pooled gas available for injection amounts to 13,750 M.c.f. per day, making it necessary to purchase 6,000 to 6,500 M.c.f. of makeup gas each day to meet injection quota requirements. Approximately 62 per cent of the produced gas can be attributed to the cycling of the injected gas.

Peak oil production since the start of gas injection was experienced in March 1949, when a daily rate of 12,503 bbl. was produced. Since reaching this peak, oil production has gradually declined at a rate approximately same as normal decline, and for the past 27 months oil production above the normal decline has amounted to 4,217,145 bbl. or an average of 5,143 bbl. per day.

Since the start of gas injection the per cent of oil produced over and above the normal decline has increased each year as shown in the accompanying tabulation, and for the 5-year period from April 1946 to March 31, 1951, inclusive, 30.36 per cent of the oil produced from the repressure area is above the normal decline.

(Continued on page 84)

THE AUTHOR

Fred J. Neslage, with West Pampa Repressuring Association, is a native of Kansas City, Mo., and graduated in petroleum engineering from University of Tulsa. He was employed by Midco Oil Corp. from 1933-35 in its Tulsa offices and in development of South Burbank field, Osage County, Oklahoma. From 1935-40 he was with Carter Oil Co. in South Burbank Unit Block pressure-maintenance project and North Burbank repressuring program. Through 1940-45 he was with Phillips Petroleum Co. as assistant district superintendent in North Burbank, and later became assistant division superintendent at Amarillo. He joined West Pampa Repressuring Association as pool engineer and project manager in 1945.

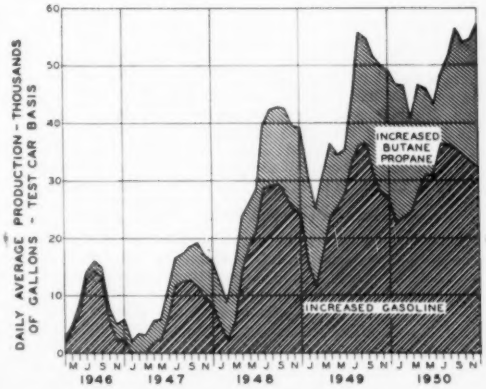

DAILY AVERAGE PRODUCTION - THOUSANDS OF GALLONS - TEST CAR BASIS
INCREASED BUTANE PROPANE
INCREASED GASOLINE
M J S N J M M J S N J M M J S N J M M J S N J M M J S N
1946
1947
1948
1949
1950

Fig. 5—Propane, butane, and natural-gasoline production.

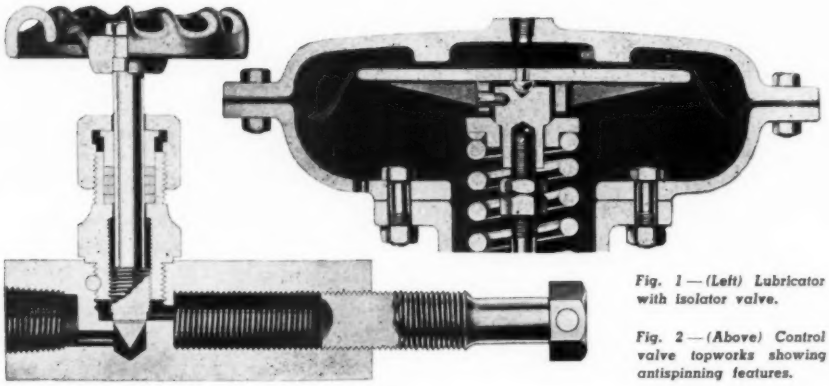


Fig. 1 — (Left) Lubricator with isolator valve.

Fig. 2 — (Above) Control valve topworks showing antispinning features.

Keeping Control Valves on Stream

. . . at Esso's Bayway refinery

by Edward Lehman* and Robert A. Rowe†

Make your control-valve maintenance problem an easier one by using the proper valve.

"A good statement," the reader will say. "But—how does one go about selecting the 'proper' valve?" At Esso's Bayway refinery the proper control valve selection is aided by:

1. Keeping valve maintenance in mind at the very start of a project.

2. Setting up initial valve specifications for optimum performance according to the demands of field service.

3. Adhering to a definite procedure when control valves are requisitioned, to make sure that these specifications will be followed on all jobs.

IN making requisitions for control valves at Esso's Bayway refinery the aim is to provide complete process information from which decisions can be made with regards to:

1. Pressure ratings to suit the process as well as other plant requirements.

2. Proper metal selection for corrosion and erosion resistance.

3. Selection of a plug—e.g., in certain applications a characterized plug is not used.

4. Safety aspect on air failure—whether valve should close or open on air failure.

5. Sizing of valve so as to carry normal flow when 60 per cent open.

Regarding the last item, there are certain deviations where special consideration demand oversizing or undersizing. For example, with normal flow equal to 10,000 gal. per hour, abnormal emergency conditions might require that the valve, when wide open, pass 25,000 gal. per hour with the same or less pressure drop available. Here it would be necessary to size the valve for wide open at abnormal conditions and allow it to control with a normally used flow of less than 60 per cent open.

Requisitioning Control Valves

In addition to these general considerations for selecting and procuring valves at Bayway, a number of other important factors guide requisitioning. These pertain to those aspects of construction and design which comply with general industrial standards, meet the most exacting demands of the individual processes, and facilitate reordering.

*General foreman, and †assistant general foreman, Instruments Department of Bayway refinery, Esso Standard Oil Co.

Stuffing box.—This is one of the most critical points in a control system. The stuffing box must allow the stem to slide with a minimum of friction to preclude hysteresis, and packing must be suited to the service. Lubricators should be the self-contained, stick-grease type. Separate grease guns are not used because with this type of lubricator too much lubricant is frequently supplied, causing leakage into the valve and excessive pressures on the packings.

An isolating valve with bonnet pinned to the lubricator to prevent accidental unscrewing should be located between the lubricator and stuffing box. On high-pressure service, the isolating valve serves to prevent the lubricant from being ejected through the feed at the time of insertion of lubricant. Fig. 1 shows a typical stuffing box and lubricator.

Prior to attachment of the lubricator to the valve, as in shipping, a steel, pipe-type plug is used to prevent dirt from getting into the stuffing box and also to protect the threads.

The stuffing-box nut should not unscrew due to vibration of the valve. Class 2 threads provide the necessary snug fit to prevent unscrewing where vibration is encountered.

Top works.—Control valves used at Bayway refinery are of a type which can be quickly disassembled. Diaphragm top plates must be testproof for 100 psi. Air conditions on diaphragm tops are ½ in. for uniformity and interchangeability. Provision is made to prevent spinning of the stem due to velocity effect of the

fluid passing through the valves. One arrangement to handle this, illustrated in Fig. 2, is that wherein a lock screw engages a slot in the inner plate. This permits the plate to pivot on an anvil pin, but prevents rotational movement of the valve stem.

Air failure.—Plug and body should be reversible in the field to open or close on air failure on standard types. Adequate provision must be made for positioner installation because positioners are often used on valves to assure good control and stability. Control valves should have easy and readily accessible external spring adjustment. It is desirable that all moving parts be nonrusting.

Metal-to-metal rather than gasket seating of body top and bottom is mandatory. Drain plugs in the bottom cap of the valve should be of the same material as the body to preclude any possibility of galvanic action. For a few jobs, as where methane and propane are handled, steam-jacketed valve bodies are used to prevent freezing as a result of pressure reduction.

Plugs. — Linear characteristic contoured-types are employed in many installations in preference to the V-ported types at Bayway refinery. For plugs of the guided type, sufficient clearance is needed to handle expansion due to temperature changes. Anticipated expansion is calculated and a few thousandths inches additional tolerance is allowed. This is especially true with butterfly valves, because despite the calculations, binding is frequently experienced, unless extra clearances are allowed.

Installation

Correct installation of valves is regarded as being just as important as the careful hookup of controlling instruments at Bayway. Installation is made to suit the conditions of the process. Location and positioning of valves are very important to prevent damage and to facilitate maintenance or repairs.

Valves are firmly mounted so that they will be free from continuous vibrations, stresses, flexing, and other undesirable conditions. Valves are never placed where they can be struck by moving processing equipment, cranes or the like, or where they are inaccessible. Precaution is taken not to locate the superstructure portion of a valve too near a hot pipe line because of the possible effect on the diaphragm material.

Valves are installed in the vertical position, in a horizontal run of the pipe line, with the topworks upright. Connecting pipes are always lined up squarely with the valve because if pipes are forced into valve, the resulting strains may cause distortion or breakage. All piping is blown or washed out thoroughly before installation to eliminate scale and other foreign matter. On valves with screwed connections, the pipe threads are coated with pipe dope, but the body threads are not coated. Flanged valves are installed with a gasket of standard make.

Bypass.—When such is used around a control valve, one-block valve is installed on each side of the control valve to isolate it from service for routine maintenance. The control valve is not crowded close to the hand (block) valves. Connections between the control valve and hand valves are made with swaged reducers rather than by straight piping, as illustrated in the correct and incorrect methods of making connections. (See Fig. 3.) Swaged reducers provide streamlined approach to the control valve. Friction encountered in straight connections is hereby precluded so that the valve, rather than the various fittings, absorbs the pressure drop and is the true controlling factor.

A manifold bleeder valve is installed on both the upstream and downstream side (Fig. 3) or the upstream side only of the control valve. Where fine bypass control is required, a metering-type high-lift precision hand control valve is used in the bypass. One arrangement of a manifold piping layout is shown in Fig. 4. Screwed connections are used for sizes through 1 in., and flanged connections are used for larger sizes.

Control valves at Bayway are advantageously sized so that they are not as large as process lines, otherwise the valve is no longer a controlling factor. For example, on a 6-in. line it is impossible to effect good control with a 6-in. valve. Components or factors which cause pressure drop in a given circuit—hand valves, exchangers and the like—should not create so large a pressure drop that the control valve is no longer a governing factor.

Valves are so located that they are readily accessible for easy periodic servicing or in an emergency. On installation, sufficient clearance is allowed beneath the control valve for removal of the plug if the body construction is such that the plug is withdrawn through the bottom. Likewise, ample space is provided above the top diaphragm cover plate so that it is easy to remove the top with the plug attached, if it is the type that comes out of the top. Also, enough clearance is allowed for the installation of top-mounted positioners, if specified.

Maintenance—A Routine Practice

Following the installation of properly selected control valves at Bayway refinery, periodic maintenance is established as a definite procedure to prevent breakdown and to keep the valves in good working order. Depending upon corrosion and erosion conditions, regular inspection is made of the valve inner works—plug, seat, guides and body. Diaphragms are checked for cracks, drying out and elasticity.

Repairs and replacement of parts.—When a valve body is corroded through on one of its internal walls or around threads of seats, it is sometimes possible to bolster or replenish

(Continued on page 85)

Fig. 4—One arrangement of manifold piping for control valve with bypass. (Drawing courtesy, Brown Instrument Division, Minneapolis-Honeywell Regulator Co.)

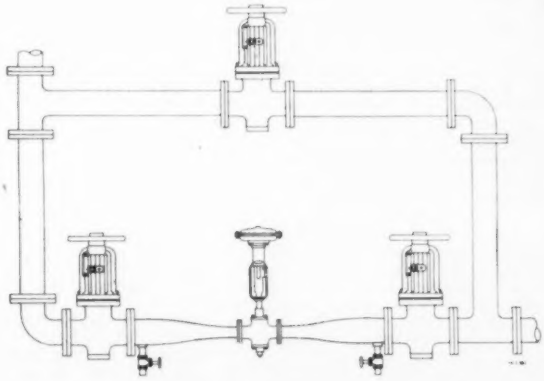
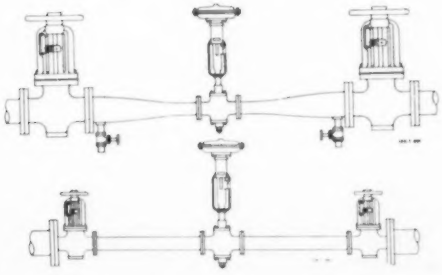


Fig. 3—(Below)—Top: Correct method for making connection between valves and control valve using swaged reducer. Bottom: Incorrect method, using straight piping.



Exploration and Drilling Activity At All-Time High In San Juan Basin

by Philip C. Ingalls

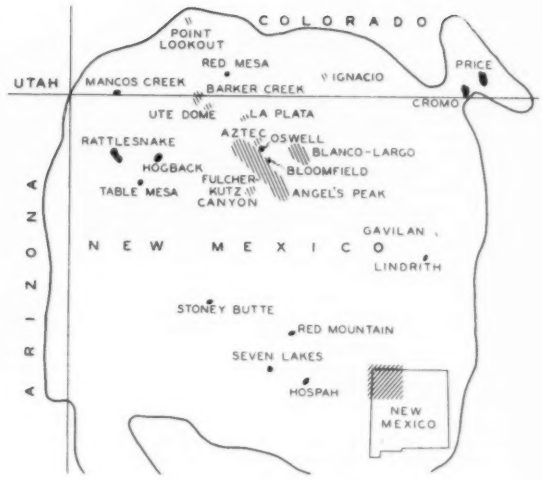


Fig. 1—Oil and gas fields of the San Juan basin.

THE long-predicted period of substantial activity in the San Juan basin of northwest New Mexico and southwestern Colorado is well under way.

It is now apparent that the basin is to enjoy an extended period out of the doldrums in which it has spent all except brief intervals of time since oil and gas were first discovered within its limits 40 years ago.

Exploration activity and development drilling in the San Juan basin are at all-time highs. Though some oil is being found, it is the once-considered-useless natural gas that has attracted the more than 60 active drilling rigs to the northwest corner of New Mexico.

Prior to the end of World War II, unfavorable marketing and transportation conditions in the San Juan basin area all but completely dampened any enthusiasm that developed over the capabilities of this area.

However, after the war, the recognition of the value of natural gas in this country's industrial economy and pending plans for a large-diameter gas line to the big marketing areas on the West Coast threw a different light on the potentialities of this isolated basin. Leasing and exploration activity in the basin became intense. Unevaluated discoveries of years past were viewed with increasing interest. Wildcatting and development activity gradually gained momentum until it has reached its present status, and the limit is not yet in sight.

Gas Reserves

During the past 4 years, new discoveries and extensions of previously known but unevaluated accumulations of gas have indicated that the volume of gas in place in the San Juan basin is sufficient to make the area one of the largest gas-producing "fields" in the country.

Fields—	Discovered	Producing formations
Angel's Peak	1947	Dakota (oil and gas)
Aztec	1920	Farmington (gas)
Barker Creek Dome	1941	Dakota (gas)
	1945	Hermosa-Paradox (gas)
Blanco	1926	Farmington, Pictured Cliffs and Mesaverde (gas)
Bloomfield	1924	Farmington (oil and gas)
Chromo	1947	Mancos (gas)
Gavilan	1949	Pictured Cliffs (gas)
Hogback	1922	Dakota (oil)
Hospah	1926	Mesaverde (oil)
Ignacio	1950	Morrison (gas)
Kutz Canyon-Fulcher Basin	1927	Pictured Cliffs (gas)
Largo	1950	Cliff House (gas)
La Plata	1949	Mesaverde (gas)
	1950	Morrison (gas)
Lindrith	1949	Dakota (oil)
Mancos Creek (abd.)	1927	Mancos (oil)
Oswell	1931	Farmington (gas)
Point Lookout	1930	Dakota (gas)
Price	1935	Dakota (oil)
	1950	Morrison (oil)
Rattlesnake	1924	Dakota (oil)
	1929	Hermosa-Paradox (oil)
Red Mesa	1924	Mancos (oil) and Dakota (oil and gas)
Red Mountain	1934	Mesaverde (oil)
Seven Lakes (abd.)	1911	Mesaverde (oil)
Stoney Butte	1928	Mesaverde (oil)
Table Mesa	1925	Dakota (oil)
Ute Dome	1921	Dakota (gas)
	1928	Hermosa-Paradox (oil)

Development drilling and production history is still too limited to say just how much natural gas can be recovered from the extensive reservoirs in the San Juan basin, but a proved and semiproved figure of more than 10 trillion cubic feet does not seem unreasonable.

If this great volume of recoverable gas is borne out by future drilling and adequate outlets can be provided, the San Juan basin will take a place with the top gas-producing states of Texas, Louisiana, Oklahoma, California, and Kansas. If more and more discoveries and extensions are made, which appears more likely than not, the San Juan basin will build up a proven gas reserve that will rival Kansas' 15 trillion cubic feet and be surpassed only by Texas' 103 trillion cubic feet and Louisiana's 26 trillion cubic feet.

Gas Reservoirs

The great volume of gas indicated for the San Juan basin occurs in Upper Cretaceous and Pennsylvanian rocks.

In the Upper Cretaceous rocks gas has been found in commercial quantities in the Kirtland shale (Farmington sandstone), the Pictured Cliffs sandstone, the Mesaverde group (Cliff House sandstone, Menefee shale, and Point Lookout sandstone), and the Dakota sandstone.

In the lesser-tested Pennsylvanian rocks commercial gas has been found in the Hermosa-Paradox formations.

The principal reservoirs at the present time are the Pictured Cliffs sand-

AGE	FORMATION		CHARACTER	
EOCENE AND PALEOCENE	Wasatch fm		250 - 2000'	Gray to brn ss & varg sh
PALEOCENE AND UPPER CRETACEOUS	Nacimiento grp (Torrejon & Puerco)		1200-3000	Brn & gray ss grnsh & gray sh
	Animas fm / Ojo Alamo ss		50 - 300	Brn ss with varg sh conglomeratic
UPPER CRETACEOUS	McDermott Fm		30 - 340	Andesitic ss & sh
	Kirtland sh (Farmington ss)		630 - 1180	Gray sh & brn ss
	Fruitland Fm		200 - 525	Gray sh with gray & brn ss
	Pictured Cliffs ss		50 - 300	Lt gray ss with sh
	Lewis sh		2000	Gray sh with ss lenses
	Mesaverde grp Cliff House ss Menefee sh Point Lookout ss		300 - 600	Massive ss & brn & gray sh with coal beds
	Mancos sh		800 - 1400	Dk gray sh with ss lenses, calc at base
	Dakota ss		150 - 250	Lt brn ss with sh lenses
JURASSIC	Morrison fm		300-600	Gray & brn ss with varg sh
	San Rafael group	Summerville equiv	80'±	Red-brn gypsif sh
		Wanakah fm	0 - 100	Gypsum & ls
		Entrada ss	30 - 300	Red & orange red ss with dk red sh
		Carmel fm	25 - 100	Sltd red brn sdy sh
	Glen Canyon group	Navajo ss	0 - 300'	Buff & red ss
		Kayenta fm	0 - 60	Red brn sdy sh locally calc
		Wingate ss	0 - 750	Dk red-brn sltd ss
TRIASSIC	Chinle fm		1500'	Red sh & ss
	Shinarump cong		0 - 125	Crm to red brn crs ss & cong
	Moenkopi Fm		0 - 280	Red brn chac & gray sh locally calc
PERMIAN	Cutler Fm		1400	Red ss & red sh
	Rico Fm		0 - 150	Red-brn sh with thin ls
PENNSYLVANIAN	Hermosa Fm		1000 - 2000	Ls, ss & sh
	Paradox Fm		0 - 3000	Salt, gypsum & blk sh with thin ls
	Molas Fm		25 - 100	Dk gray & purple sh
MISSISSIPPIAN	Leadville ls		100'	White & brn ls
DEVONIAN	Ouray ls		100	Gray ls
	Elbert Fm		0 - 150	Lst ss & sh
CAMBRIAN	Ignacio quartzite		0 - 80	Quartzite, sdy sh & cong
PRE CAMBRIAN				Granite & schist

Fig. 2—Generalized geologic column of the San Juan basin. (Prepared by Frank C. Barnes and George Hemenway.)

stone, the Point Lookout sandstone, and the lower Paradox limestone.

Pennsylvanian.—Commercial gas production in the lower Paradox limestone was proven at Barker Creek field in early 1945 when a well was completed at 8,420-98 ft. for a back pressure open-flow potential of 25 million cubic feet of gas per day, natural.

This field is a prominent asymmetrical anticline well defined by surface exposures of sandstone of the Mesaverde formation. Axis of the structure trends northeast-southwest. The southeast flank of the structure has a dip of 350 ft. per mile from the crest of the anticline to a synclinal area between Barker Creek field and Ute Dome. The northwest flank dips away from the crest at 150 ft. per mile.

The effective structural closure on top of the second zone of the lower Paradox is indicated to be 450-500 ft. The reservoir within the effective closure is a highly fractured and jointed, dense, impure limestone. Within this formation are three zones characterized by intercrystalline, vugular, and semicavernous porosity separated by dense siliceous limestones, which are intricately fractured and jointed. About 15 per cent of the total effective gas-bearing thickness is made up of the intercrystalline to cavernous zones of porosity.

At Ute Dome field additional gas-productive zones are indicated in the upper Paradox and lower Hermosa formations at 7,900-8,000 ft. depth.

Upper Cretaceous.—The lithologic characteristics of the two most important reservoirs of Upper Cretaceous age, the Pictured Cliffs and Point Lookout sandstones, are similar. Caswell Silver, consulting geologist of Albuquerque, N. M., describes them as medium to fine-grained, subrounded to subangular, argillaceous, slightly calcareous, and somewhat fractured sandstones.

The sands range considerably as to both cement content and sorting, and porosity in individual wells varies with the amount of silt or cement in the sands. In the more continuous pays deliverabilities are more closely related to changes in porosity and permeability than to sand thickness and commercial development to date has followed well-defined permeability and porosity trends. Examples are the well-defined Blanco trend in the Point Lookout sandstone, which appears to be due to better sorting; and the Fulcher Basin-Kutz Canyon trend in the Pictured Cliffs sandstone, which appears to have resulted from both well-sorted sand and absence of cement.

In general the pays are tight. Open-flow potentials from Pictured Cliffs sandstone wells normally run between 50,000 and 400,000 cu. ft. per day. From Point Lookout wells the open-flow potentials are on the order of 100,000 to 10,000,000 cu. ft. daily. Some wells within postulated productive outlines have encountered sands too tight to yield more than a slight order of gas.

Structure.—The indicated areal extent of the two principal gas-bearing sandstones of Upper Cretaceous age are shown by Figs. 4 and 5. Within these large areas all tests have encountered some gas.

Though the present gas-producing areas have not been defined, their indicated areal extent is so large that structural closure appears highly improbable. Locally there are highs in the area but so far none have been found to contain gas in otherwise water-saturated rocks.

On the other hand, it has become rather evident that the gas accumulations are "blanket" gas saturations originally trapped in broad belts of porosity which wedge out to the northeast. On the southwest limb of the basin, water is found structurally higher than the gas, indicating a reversal of attitude after accumulation, and it appears probable that water is encroaching downdip and that gas is being dissipated at the outcrops. It is doubtful that this water encroachment will affect commercial exploitation, however, as the rate has been calculated to be on the

order of 1 mile every 500,000 to 1,000,000 years.

Mesaverde group.—All units of the Mesaverde group, here restricted to that portion divided into Cliff House, Menefee, and Point Lookout, exhibit finer and finer grained facies northeastward. The group is a large porosity wedge between the converging Mancos and Lewis shales as shown by Fig. 6.

1. Point Lookout sandstone.—This formation is 150-200 ft. thick. It is a medium to fine-grained sandstone interbedded with sandy shale. The lower portion is transitional with the underlying Mancos shale and over a wide area the upper part of the formation consists of a massive bed of medium-grained sandstone which is the principal gas horizon within the Mesaverde group.

The Point Lookout sandstone has been tested over an extensive area. Fig. 4 shows the basinward limit of the outcrop of the Mesaverde group and the postulated distribution of Point Lookout gas. Indications are that this area of some 900,000 acres may be conservative.

2. Menefee formation.—The beds of the Menefee formation are extremely irregular. Thickness varies from 1,600 to 0 ft. as the formation forms a northeastward thinning wedge between the convergent Point Lookout and Cliff House sandstones. The formation becomes sandier as it thins to the northeast.

The Menefee formation has indicated gas in wells scattered throughout its sandy phase, but it is only in the area of the Blanco trend that the entire Mesaverde section is tested with open hole. Results of these tests have shown water-free Menefee over an area of about 30,000 acres. Within this area the Menefee, where permeable, contains gas or high-gravity oil. At other places it has shown oil and gas interbedded with water or, infrequently, gas alone in sand lenses. No porosity trends have been determined for the Menefee to date.

3. Cliff House sandstone.—The Cliff House sandstone is a transition zone between the largely nonmarine Menefee formation and the marine Lewis shale. Subsurface records show this sandstone to be composed of lenses

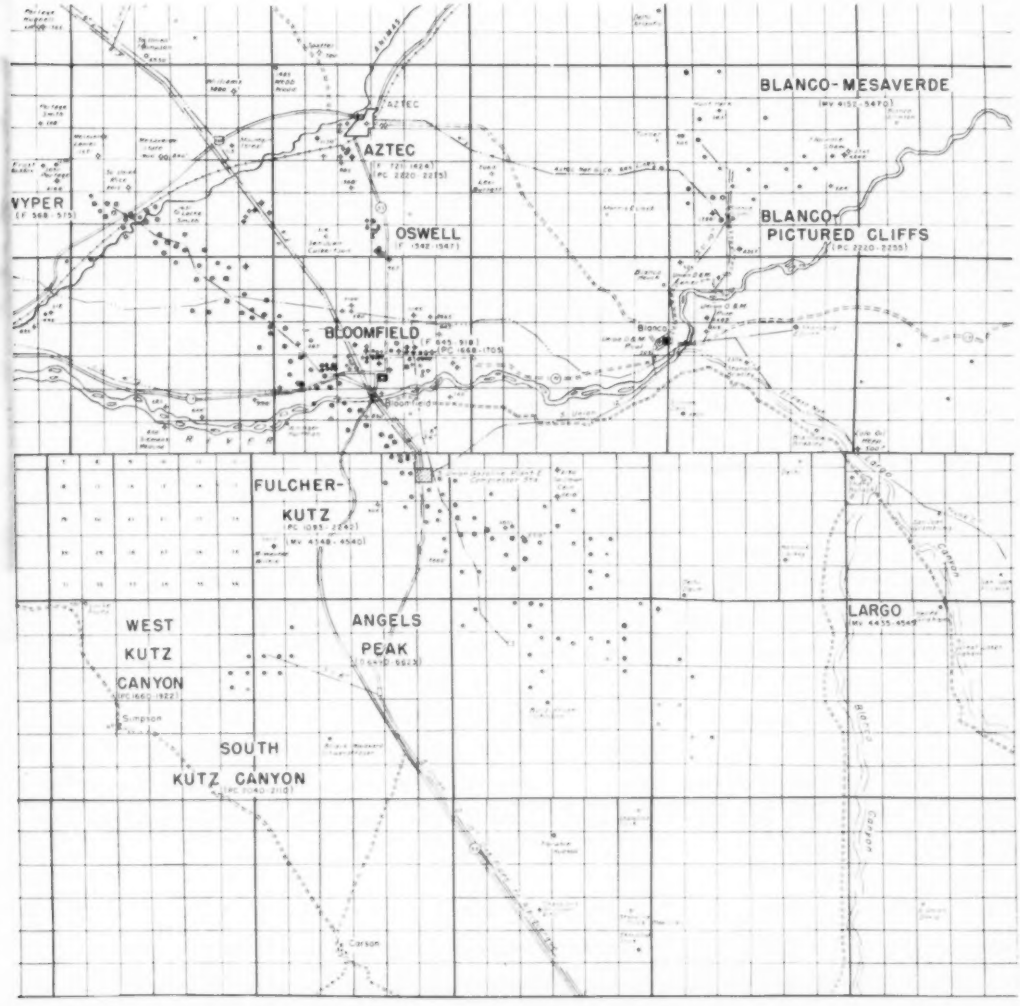
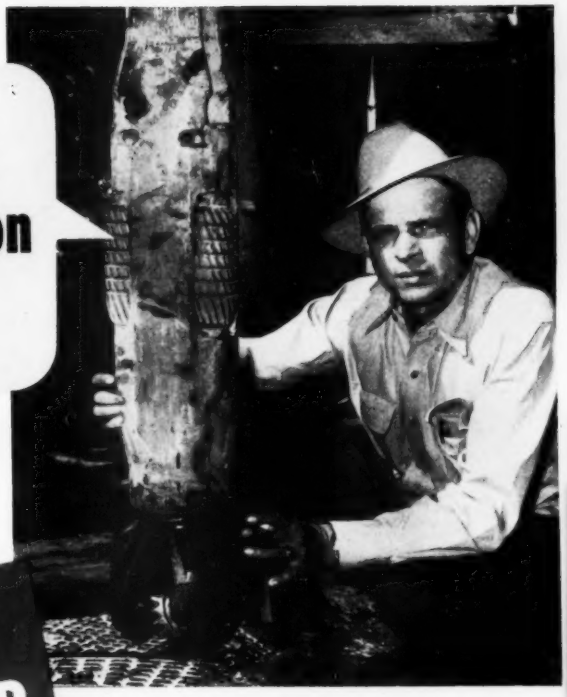


Fig. 3—Detailed map of active gas area in the San Juan basin. (Portion of United States Geological Survey's map of Farmington area.)

I like this pair for hard-formation drilling

...says Guy Boyd, assistant drilling superintendent for McAlester Fuel Co., Magnolia, Arkansas.



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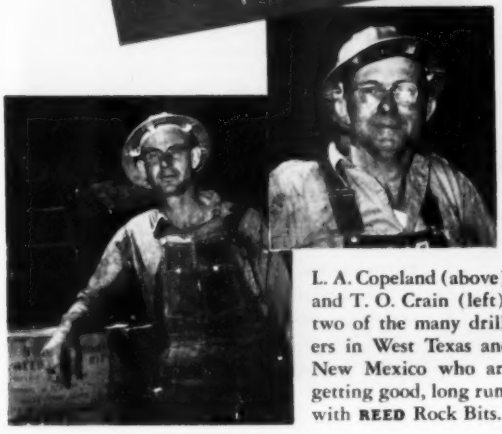

L. A. Copeland (above) and T. O. Crain (left), two of the many drillers in West Texas and New Mexico who are getting good, long runs with **REED** Rock Bits.

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are available in any type desired. Short bit reamers can be furnished with the same, O.D. as the drill collars.

Fig. 120 Extra Short Bit Reamer

Fig. 119 REED Type 38 Short Bit Reamer

Fig. 118 REED Heavy Duty Single 3 Point Reamer, Type 38

Fig. 117 REED Heavy Duty Double 3 Point Reamer, Type 38

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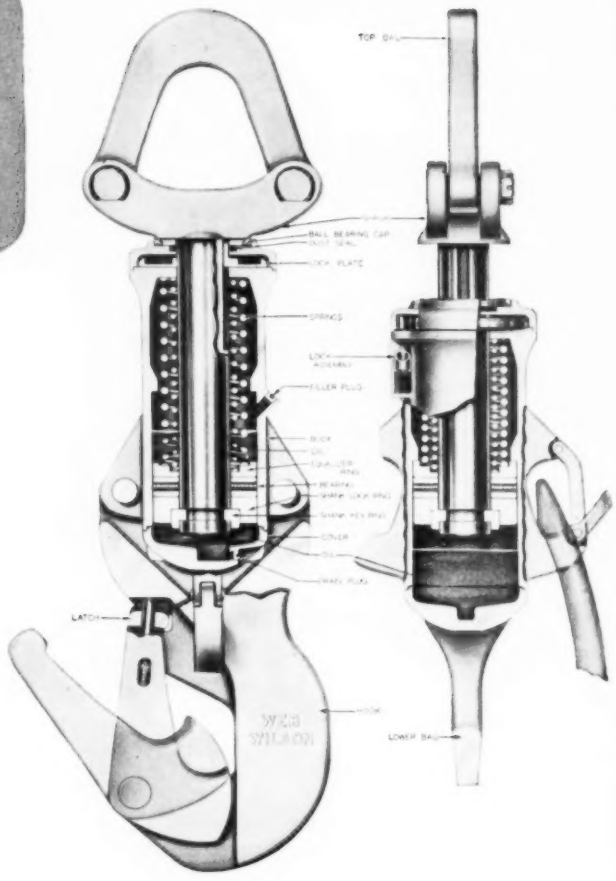

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. . . contain an "oil-bath" in which the plunger and bearing operate. This oil cushion not only insures perfect lubrication of the bearing, but also provides controlled hydraulic action of the spring,—an exclusive feature which eliminates bouncing the pin-end thread on the box end of tool joints when breaking out, and avoids battering the threads and sealing shoulders of tool joints. ★ The oil cushion feature minimizes shock on hoisting equipment and the entire drilling string, and makes the tool ideal for jarring or fishing.

***OTHER IMPORTANT ADVANTAGES:** Bearings and Spring work in an almost constant oil bath. ★ The new Ball Bearing Cap assures positive, free swivel action. ★ Load-Carrying Ears are now on the Hook Member of the Connector-Hook (instead of the Body) thus increasing head room between the bottom of the hook and the elevator. ★ No "Load-carrying" threads—Anti-Friction Roller Bearings—8-Point Locking Mechanism. ★ Top Bail fits all standard traveling blocks; and the shank (with upper bail removed) connects directly to traveling blocks.*

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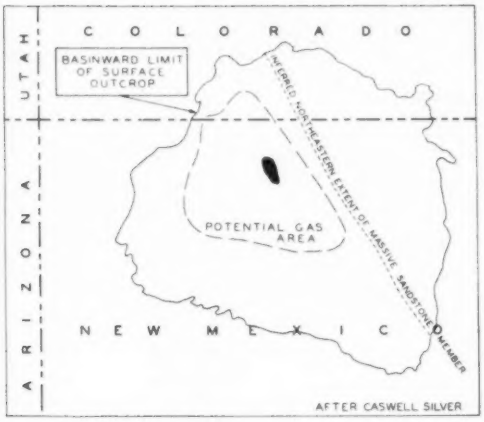


Fig. 4—Map showing basinward limit of outcrop of Mesaverde group and sandy units of the Mancos shale, and the inferred subsurface extent of the massive sandstone member of Point Lookout sandstone. All wells within limits of potential gas area have encountered gas in Point Lookout sandstone. Blanco, principal Point Lookout field, is located.

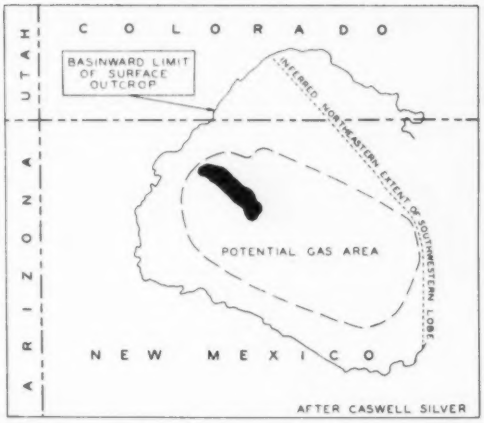


Fig. 5—Map showing basinward limits of the outcrop of the Pictured Cliffs sandstone and the inferred subsurface extent of the southwest lobe. All wells within the limits of the potential gas area have encountered gas in the Pictured Cliffs sandstone. Fulcher Basin-Kutz Canyon, principal Pictured Cliffs field, is located.

which grade northeastward into the Lewis formation. Some of these lenses are of significant size, however. In the Blanco area lenses are known to extend up to 5 miles in length. It is in this area that the only definite occurrence of gas in the Cliff House sandstone has been indicated. Approximately 30,000 acres are considered as potentially productive.

Pictured Cliffs. — This sandstone, which closely resembles the Point Lookout sandstone in general appearance, is 50 ft. to 500 ft. thick. It thickens northeastward at the expense of the overlying Fruitland formation.

The Pictured Cliffs sandstone is medium to fine grained and is gradational northeastward into the Lewis shale. It outcrops on all but the eastern edge of this basin (see Fig. 5).

Caswell Silver divides the Pictured Cliffs sandstone into an older southwestern and a somewhat younger northeastern unit. It is the southwestern unit or lobe that is the important gas horizon in the basin.

The area believed to be underlain essentially continuously by gas in the Pictured Cliffs sandstone as indicated at the present time is shown in Fig 5. This area is approximately 1,555,000 acres. As with the Point Lookout sand, it is likely that as more information becomes available that the known gas area will be greater than now indicated. Water has been encountered at a few wells close to the outcrop.

The Fulcher Basin-Kutz Canyon trend, shown on Fig. 5, is the principal gas area being produced from this horizon at the present time. Pictured Cliffs gas has been found at widely scattered areas in the northeastern portion of the basin but potential reserves for these undeveloped areas cannot yet be estimated.

Lands of the San Juan Basin

In the guidebook for New Mexico Geological Society's first field conference held last November a chapter on the complex land-status pattern of the San Juan basin was included. A. L. Duff, Jr., and J. V. Fritts classified the 30 land-status types into 5 major categories: (1) public lands, (2) Indian lands, (3) state lands, (4) railroad lands, and (5) patented lands. Here is a digest of their report on the methods of obtaining oil and gas leases, costs, and obligations on the part of the lessor.

Public lands.- Public lands comprise the largest part of the land in the basin (about 45 per cent). Most of the public lands in the San Juan basin have been patented out insofar as the surface rights are concerned (the United States retaining the mineral rights), but in some areas of the basin considerable acreage will be found which never has been patented, and the United States therefore retains both surface and mineral rights.

To obtain an oil and gas lease on public lands an application must be submitted to the Department of the Interior (Bureau of Land Management) for acreage not to exceed 2,560 acres per lease. Each citizen of the United States (as well as corporations) is allowed permits not to exceed 15,360 acreas in any one state. One may, however, hold an additional 100,000 acres under option to do certain geological or geophysical work.

The term of the leases is for a period of 5 years with a preference right of extending the lease another 5 years. There is no bonus for the lease, but the rentals are

(Continued on page 89)

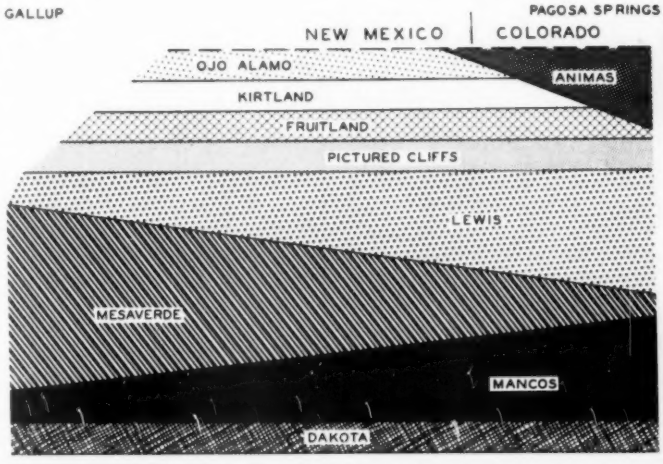


Fig. 6—Hypothetical section showing relationship of beds in the San Juan basin between Gallup, N. M., and Pagosa Springs, Colo. (After Paul Umbach, Stanolind Oil & Gas Co.)

PACKERS FOR DUAL COMPLETIONS

by R. D. McBrian*

Three kinds of packers are being used by operators: The anchor, hook-wall, and retainer types. Each has its peculiar advantages—and disadvantages.

THE Petroleum Administration for Defense issued recently a four-point program, recommending measures designed to "stretch" available supplies of steel, especially with regard to tubular goods. One of the measures recommended called for increased use of dual completions. The object, of course, is to get two wells while using only one string of casing and, in most cases, only one string of tubing. A minimum of 43,400 new wells annually has been set as a goal to meet requirements of the mobilization program. Since predicted production of steel in the immediate future does not promise sufficient tonnage to meet that figure, it is quite evident that the "stretching" process must begin soon.

Few questions concerning production problems have aroused more controversy than dual completions and there is still a great difference of opinion. No one questions the desirability of getting the production of two wells for the price of one, but doubt still exists in the minds of many that it is physically possible or economically practical to do so. Unsuccessful attempts at dual completions or excessively expensive completions have contributed to this doubt.

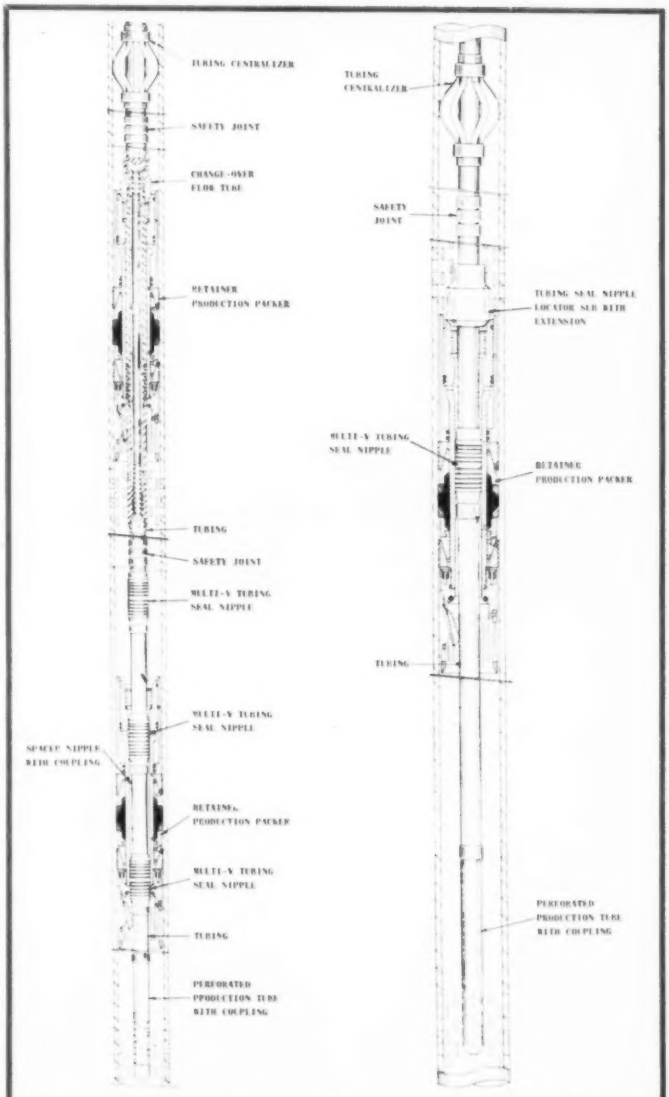
Some unsuccessful jobs have resulted from equipment failure; some from insufficient knowledge of well conditions or ability to produce. Some jobs have been completed successfully from a physical standpoint, but at such a high cost as to be impractical.

Advance in Knowledge

Within the past few years a great advance has been made in the over-all knowledge necessary for decision as to the practicability of any proposed dual completion and for carrying forward the operation. Likewise, much improvement has been made in dual-completion equipment. Better packers, casing heads, christmas trees, chokes, and similar equipment, are available to reduce the number of equipment failures. Operators and suppliers have improved procedures through study and experience.

Through surveys, tests, core analyses, and other techniques the ability of each zone to produce in sufficient volume, under existing conditions and in accordance with regulations of governing conservation bodies, is being predicted with greater efficiency. Size of the well casing is often being altered better to fit requirements; cementing programs are being redesigned to insure separation and prevent contamination.

*Baker Oil Tools, Inc., Houston.



Two-zone production method using two retainer production packers, a changeover flow tube, and three multi-v tubing seal nipples.

Two-zone production method using retainer production packer, tubing-seal nipple locator sub with extension, and multi-v tubing seal nipple.

Positive Seal!

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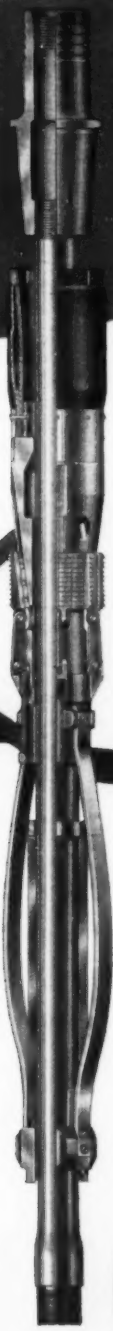

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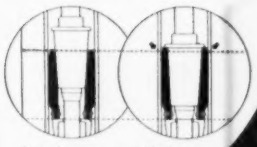
- ✓ Specially engineered dovetail slips and guides!
- ✓ Patented lateral expanding cup assembly avoids crushing of the cup in this sealing element!
- ✓ All the seal is accomplished in one sealing element!
- ✓ Patented, American Iron simple-setting arrangement!
- ✓ Full tubing size opening through length of packer!
- ✓ Smooth running because of ample fluid by-pass area!



Note how cup assembly is expanded laterally (not compressed) to avoid crushing!

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Multistage cementing of the oil string, squeeze cementing, and planned use of casing centralizers and scratchers at critical points have proved beneficial in many instances.

Experience has demonstrated the necessity of cleaning the walls of the well casing and the well fluids to prevent installation or operational difficulties connected with surveying instruments, perforating guns, packers, chokes, and so on. New or improved tools and procedures have been developed to perform these preparatory cleaning jobs more quickly, efficiently, and economically. Progress has been made in artificially stimulating production through use of explosives, acids, hydraulic formation-fracturing procedures, and the like resulting in the development of commercial production from zones previously abandoned.

Production Packer

From an equipment standpoint, possibly the most critical job is performed by the production packer, which must meet several strict requirements if the completion is to be entirely satisfactory. The first requirement, of course, is that the packer separate the zones absolutely and with a considerable degree of permanance even though well conditions may change. This should be accomplished in a manner which will permit allied or accessory equipment to function efficiently. Furthermore, the packer setting should be planned to provide for future possibilities of remedial work or changes in method of production, as may be found necessary.

Three general types of packers are being used extensively in these completions: anchor type, hook-wall type, and retainer type; each having its peculiar advantages and disadvantages.

The anchor-type packer is simpler and cheaper but requires a measured tubing anchor and a solid well bottom on which to set it. It is subject to premature setting if run too fast, if trash or junk is encountered, or if the well tries to flow. It will handle pressure from above quite well, but a pressure differential from below tends to unseat the packer, making it necessary to set down more and more weight as pressures increase, sometimes resulting in corkscrewed tubing through which it is difficult to run chokes, bottom-hole-pressure bombs, and such. In extreme cases, it will be impossible to apply sufficient weight to maintain a packoff, especially in the larger sizes, as the pressure is effective on the entire area of the expanded packer.

The anchor-type packer is a removable type, but under some conditions removal may be made difficult by deposits of sand, paraffin, or other solids, which pack either on top of the packer or around the tubing anchor. Extreme conditions may necessitate cutting the tubing and washing over the packer, usually a comparatively simple operation, since only the resilient packing element will contact with the casing.

The hook-wall-type packer, having slips to permit its being set at any desired point in the casing, does not require an anchor or a solid well bottom. Premature setting is not a consistent hazard and does not necessarily result in added expense when it occurs. Like the anchor-type packer, it will handle pressure from above quit well, but is subject to the same disadvantages when high pressure below the packer is encountered. Here, too, deposits of solids on top of the packer may make removal difficult; fishing jobs will present greater problems, since steel slips will be in contact with the casing, complicating the washing-over operation. It is usually necessary to rotate the tubing in one direction to set the hook-wall packer and in the opposite direction to retract the slips, thus care must be used to avoid backing off when turned to the left.

Metal parts of both anchor and hook-wall type packers are normally made of steel to provide necessary tensile strength, further complicating removal when unable to pull or fish the packer. In retrieving either type, care must be used to avoid swabbing in the well; furthermore, pressures of all exposed zones are imposed upon the casing and the surface control equipment as soon as either type is unseated.

More Expensive Type

The retainer-type packer is somewhat more expensive than the average anchor or hook-wall type. It is not removable and requires two round trips of the tubing for installation, one to set the packer, another to install the production string. Premature setting of this packer may be caused by rough handling, trash or junk in the mud, or by any condition resulting in a considerable surge of fluid. This possibility has been greatly reduced where operators have recognized the necessity of careful handling, efficient cleaning of the casing inside diameter and thorough conditioning of the well fluid.

The necessity for making two round trips with the tubing is being eliminated by equipment developed to permit running and setting the packer on a wire line, thus greatly reducing expensive rig time on deep wells. This equipment develops necessary setting tension at the setting point in the well, rather than from the surface, thus no excessive tension is applied to the wire line. Although it may be adapted for use on either an electric line or sand line, a great majority of jobs performed to date have been accomplished via the electric line. Premature setting of the packer has been practically nonexistent in well over 1,000 jobs performed with a wire line.

Although not removable, the retainer-type packer is completely drillable, major metal parts, including slips, being made of high strength cast iron, which, when compared with steel, is practically unaffected by corrosive well fluids. The corrosion resistance of the cast iron used in the retainer-type packer has been proved by use in salt-water-disposal wells and in many wells carrying high concentrations of hydrogen sulfide in the Rocky Mountain, Texas Gulf, West Texas-New Mexico, and southwestern Arkansas areas of the United States, as well as in Canada and other parts of the world.

Regaining Positive Seal

When steel tubing in such wells has been removed, after years of service, and found to be full of holes, due to corrosion, it has been possible in many cases to replace damaged tubing and sealing nipples and again effect a positive seal and separation in the same old packer. Some operators are now using tubing and packer accessories made from nickel alloy or other corrosion-resistant metals, to lengthen their life; some are even resorting to special threading of the production string toward the same end.

The retainer-type packer is set and anchored in the well casing with a tension force of from 30,000 to 50,000 lb., depending on size, which assures a firm bite of the slips into the steel casing and positive expansion of all packing elements. Having slips at top and bottom which prevent movement in either direction, it holds pressure equally well from above or below without applying weight. Thus the tubing may hang straight and even in tension, if desired, facilitating the running of chokes, bottom-hole-pressure bombs, tubing swabs, and such, and allowing for anticipated expansion of the tubing due to temperature.

On the other hand, tubing weight may be imposed on the packer to relieve tubing of some tension in deep wells, or to offset expected contraction of the tubing due to cooling, especially in high gas-oil-ratio wells. A synthetic-rubber packing element, extremely resistant to chemical action of well fluids and high temperature, and reinforced at all points by lead seals to prevent flow, plus the corrosion resistance of cast-iron metal parts, promises a degree of permanence equal to any expected requirement of the packer itself.

Tubing seat nipples, installed in the tubing string, are properly positioned to seal in the honed and polished bore of the packer through use of a locator sub of the proper type. Movement of fluid in either direction between packer and tubing is prevented by the replaceable, opposed V-type seals on the tubing seal nipples. The unobstructed bore of the packer permits running additional tubing below the tubing seal nipples in order that tubing perforations

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BLUE marks 4000 p.s.i.

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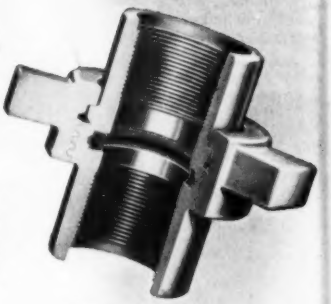

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READY FOR ROUGH WORK
The 3-lug wing nut with fast-action Acme threads provides quick knock-down or make-up of a strong, leak-proof union.

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may be located at any desired point below the packer.

A flapper-type back-pressure valve is incorporated in the standard packer to hold well pressure from below when the tubing string is withdrawn, but a special adaptation permits substitution of a standing valve to prevent dumping fluid in the annulus on a low-pressure zone below the packer; this is particularly desirable when the annulus is filled with expensive, especially prepared anticorrosion fluid. Since only the tubing string is removed, there is no tendency to swab the well.

Since the tubing may be withdrawn from the well without disturbing the retainer-type packer, some types of remedial work may be accomplished without drilling or even damaging the packer, and it may be utilized even to assist in accomplishing the desired operation. Since the packer bore is straight and unobstructed, small-diameter tubing may be run through to permit washing or plug spotting. In most sizes it is even possible to run through with a tubing gun and reperforate below the packer. With tubing seals positioned in the packer, high-pressure squeeze cementing, formation fracturing, or acidizing may be accomplished as well as, and, under certain conditions, even better than with tools especially designed for those purposes.

Although capable of handling much higher differential pressures from below the packer, since only the seal nipple area is affected, the retainer-type packer will also withstand high pressures from above. It will permit flowing or swabbing through the tubing, while holding the casing annulus full of heavy mud above the packer. This ability to withstand high pressure, from either above or below, makes the retainer-type packer a multipurpose tool, permitting such operations as high-pressure acidizing or formation fracturing, flow or swab testing, and squeeze cementing, in any sequence on one zone with one tool. This effects a saving on the cost of the different tools otherwise involved and a tremendous saving in rig time, but leaves the packer free for production purposes at any desired point in the sequence prior to actual cementing up of the packer.

In wildcat or multizone wells, such consecutive operations have been repeated many times in determining zone possibilities. If it be desired to squeeze cement or acidize a zone above the packer but protect the zone below, a bridging device may be seated in the packer to convert it to an effective, drillable bridge plug. Under some conditions, a removable bridging device may be used and later fished out, returning the packer to its original condition. Thus, the retainer-type packer may be used in those completion operations preceding actual production, with efficiency and economy, and its versatility remains available to the operator to meet changing well conditions.

Development of equipment to permit setting the retainer-type packer on a wire line provides certain pronounced advantages. Accessory equipment provides for running a feeler and junk catcher before running the packer, thus gaging the inside diameter of the casing for proper clearance and removing from the well fluid debris which could cause trouble otherwise. Premature setting is practically unknown and application of the setting force at the setting point, rather than from the surface, assures sufficient setting tension at the packer, even in crooked holes or with limited surface hoisting equipment.

Conditions under which a packer must function vary widely in different wells or even in the same well at different stages in its life, especially in a dually completed well. Factors of depletion, intrusion of water, or gas-oil ratio may not change in the different zones on the same schedule. Different rates of flow from each zone may cause changes of differential pressure or temperature, either of which will alter the forces which the packer is called upon to control. The design of the retainer-type packer provides adequate control of such changing forces.

When each zone will flow freely, there should be little difficulty in maintaining efficient production. A single packer set between zones, permitting the lower zone to flow through the tubing and the upper zone to flow through the casing, offers the simplest solution at least expense. The same installation suffices as long as the upper zone will flow through the casing, even though the lower zone must be pumped. When it becomes necessary to produce the upper zone through the tubing because of reduced pressure or because of paraffin, the addition of a second packer and a changeover device may be used to effect the exchange simply and economically, since no radical change in production string design is necessary and since all of the values of the first packer are retained in the installation.

Although the above installations meet conditions found in most areas, many variations have been worked out to meet peculiar conditions. Side-door chokes, gas-lift valves, stub casing strings, macaroni strings, or parallel tubing strings may be required to meet conditions found in an area or even an individual well. Such special or accessory equipment has made efficient production possible under conditions which would have prevented it otherwise. How-

(Continued on page 87)

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Canada
Middle East
Rest of World
Producing Equipment Exports 50%
Drilling Equipment Exports 48%
Refining Equipment Exports 80%
Exploration Equipment Exports 26%
Latin America constitutes the major export market today for petroleum equipment. Petroleo Interamericano offers the only advertising vehicle through which manufacturers may acquaint all buyers with their products and services.
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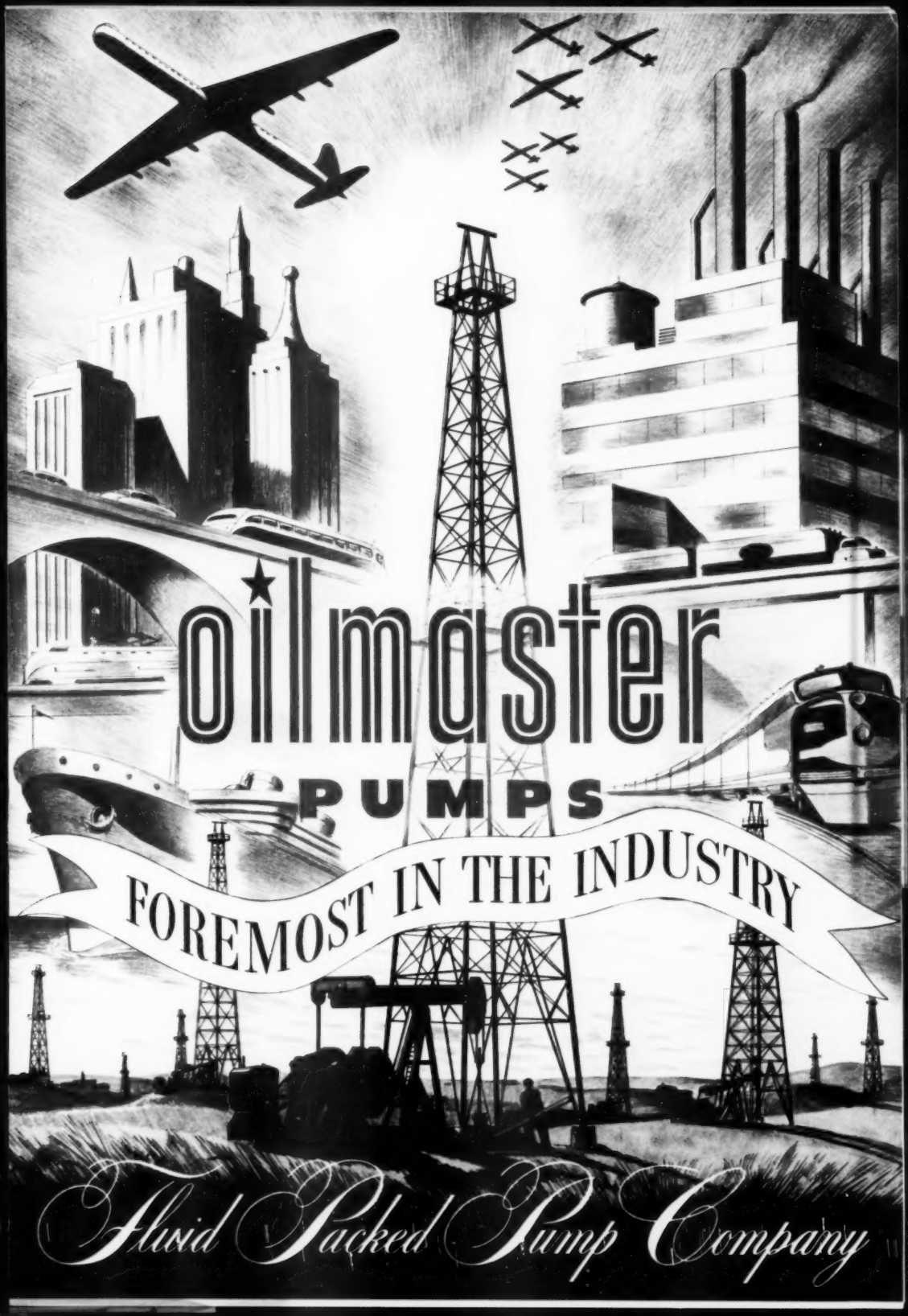
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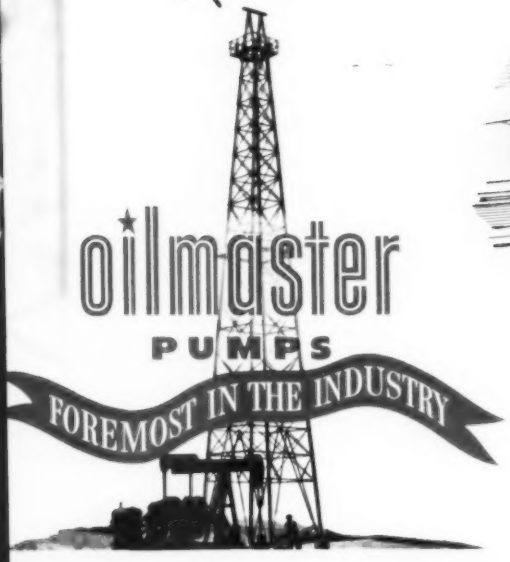

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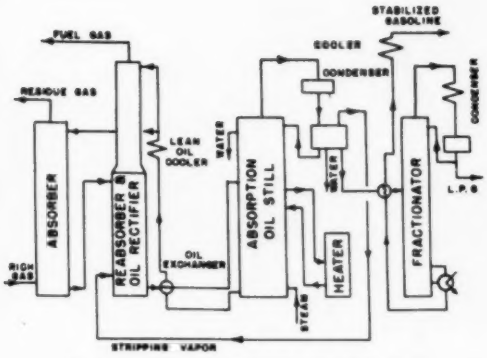

Fig. 1—Flow diagram of an absorption-type plant.

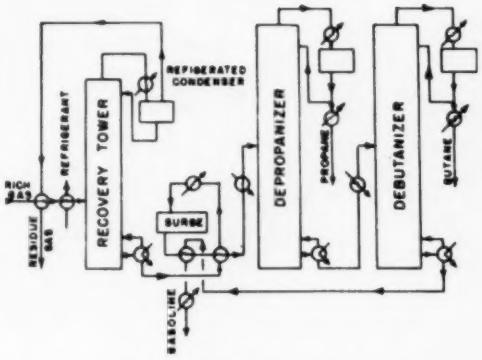

Fig. 2—Vapor-rectification system.

Licking Liquids in Gas Pipe Lines

It's better to prevent their entrance than to try to expel them

by J. H. Echterhoff*

EVERYONE engaged in the gathering and transmission of natural gas has experienced trouble from the presence of liquids in pipe lines. Liquids decrease the capacity of a pipe line, increase corrosion problems, and under certain conditions can stop the flow of gas completely by the formation of hydrates. For these reasons the prevention of the formation of both hydrocarbon and water liquids in the gas stream is necessary to maintain maximum pipe-line efficiency.

Separation of liquids from a natural-gas stream is a mechanical problem. There are numerous separators on the market, each of which will satisfactorily accomplish the desired separation of any liquids that have been formed at the point of separation. It is to be noted, however, that mechanical separators are seldom 100 per cent efficient and that if manufacturers' rated capacities are not adhered to, serious carryover of liquid can be expected.

The real problem, however, is not the separation of gas from a liquid—it is rather the "conditioning" of the gas so that from the time it enters the pipe line, initially, until it reaches the ultimate consumer, no liquids will be formed.

Removal of "liquefiables," or constituents which are in a vapor state but which can be expected to condense with a change in temperature and/or pressure, is somewhat more difficult and it is the purpose of this paper to discuss the more popular methods used and some of their advantages and disadvantages.

There are two types of liquefiables which must be controlled if we are to prevent the formation of liquids in the pipe line. These are (1) hydrocarbons and (2) water.

Control of Hydrocarbon Liquids

The control of hydrocarbon liquefiables is accomplished by one of two methods:

1. Processing through a natural-gasoline plant.
2. Separation through a low-temperature separator.

Any plant processing natural gas for

*United Gas Pipe Line Co., Shreveport, La. Presented at Southern Gas Association annual convention, Biloxi, Miss.

READING FOR PROFIT — JOURNAL CHECK CHART

Troubled With Condensation in Gas Pipe Lines?

JOURNAL CHECK CHART.—What do you know about the problems involving liquid condensation during gas transportation in pipe lines? Check each point.

- ☐ 1. The presence of condensed liquids in gas pipe lines (1) increases line corrosion, (2) decreases line capacity, and (3) may seriously retard or stop flow.
- ☐ 2. Safe distillate concentrations to prevent condensation under pipe-line conditions can be determined from correlations developed by dew-point calculation. For example, a gas with not more than 0.2 gal. gasoline per 1,000 cu. ft. may ordinarily be transported at 900 to 1,000 psi. without condensation.
- ☐ 3. Safe water-vapor concentrations can also be determined, from vapor-pressure curves. A gas to be piped at 800 psi. minimum temperature of 30° F., must be dehydrated to 7.5 lb. water per million cubic feet.
- ☐ 4. Of the water-vapor removal systems generally used, (a) the liquid desiccant system is limited to maximum gas inlet temperature of 80° F., but may be most economical for small systems. (b) Solid-desiccant systems can handle gas inlet temperatures up to 95° F. (c) The low-temperature separator is good where large pressure drops can be tolerated.

2 BEAIRD - Ingersoll-Rand

Now you can have a more powerful, lighter weight packaged compressor plant, designed and built with the same superb craftsmanship which has made Beaird-Ingersoll-Rand the unparalleled standard of packaged compressor plants in over 100 oil and gas fields.

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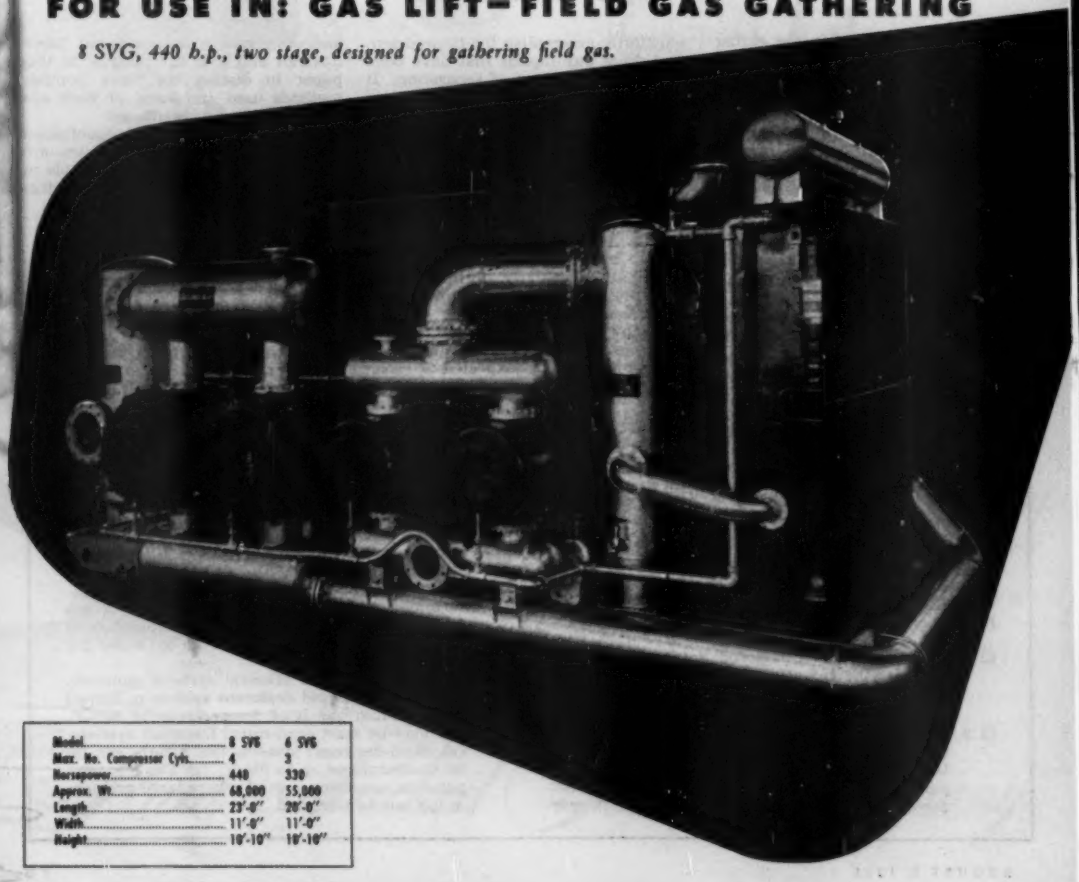
8 SVG, 440 h.p., two stage, designed for gathering field gas.



Model	8 SVG	6 SVG
Max. No. Compressor Cyls.	4	3
Horsepower	440	330
Approx. Wt.	68,000	55,000
Length	23'-0"	20'-0"
Width	11'-0"	11'-0"
Height	10'-10"	10'-10"

6 SVG, 330 h.p., three stage, designed for utilizing flare gas in a closed gas lift system.

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New design of engine, compressor, and fabricated steel base have reduced pounds per horsepower by one half.

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IT IS EASY TO INSTALL. Only three connections required to put it on stream.

IT REQUIRES ALMOST NO ATTENTION. Automatic controls and simple operation make it unnecessary to have specially trained attendants.

IT COSTS LESS TO MAINTAIN. The Ingersoll-Rand compressor has a 4-cycle direct connected gas engine with conservative operating speed for minimum wear and long life.

Each packaged plant is custom designed by Beaird's experienced gas engineers to meet your particular requirements.

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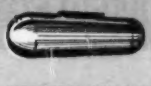

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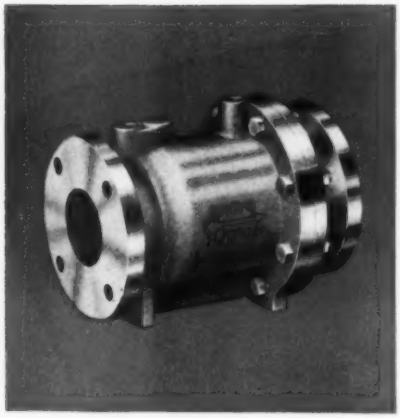

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FLEXFLO Valves are basically diaphragm-operated, using an expansible tube as both diaphragm and valve. With only four simple parts including but one non-metallic moving part, Flexflos assure long, trouble-free service with minimum attention. Field replacement of the simple tube-core assembly affords new valve performance in a matter of minutes. Depending upon the operating system used, positive-acting Flexflos give highly efficient service as:

BACK PRESSURE REGULATORS
PRESSURE REDUCING REGULATORS
PRESSURE RELIEVERS
CONSTANT FLOW VALVES
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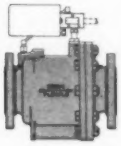
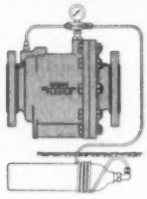
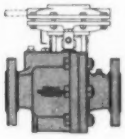
REMOTE CONTROL VALVES
AUTOMATIC SHUT-OFF VALVES
. . . and many other applications.



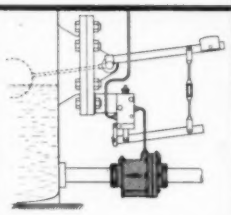
Model 80-41F. Solenoid-operated Flexflo for on-off service.



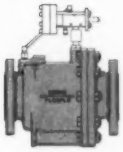
Model 888. Flexflo Dome Pressure Loaded Reliever for back pressure or relief service.



Model 898. High pressure Separator Oil Dump Valve for operation from level pilot.

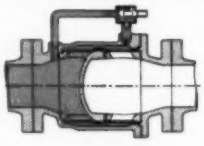


Model 80-899. Separator Oil Dump Valve for operation from float lever.



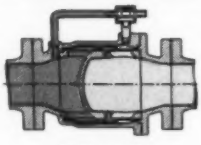
Model 80-42F. Pressure-operated Flexflo for on-off service.

flexflo lets pressure do the work:



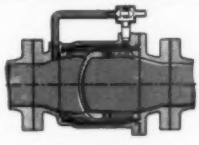
CLOSED

1 The only moving part in the Flexflo Valve is a tough Buna N tube stretched over a cylindrical slotted metal core. When closed, line pressure from within, tending to force tube off core, is opposed by equal jacket pressure. Tension of the tube itself forms a positive, bubble-tight seal. The tube conforms to uneven surfaces and is hence unaffected by foreign matter or erosive wear.



THROTTLING

2 As jacket pressure is reduced, line pressure begins to roll the tube off the core, opening the valve. Throttling is smooth and even. The Flexflo reacts instantly to the slightest pressure variations, compensating automatically for surge or shock impulses. Stability at all flow positions is accurately maintained. Fluttering and chattering are reduced to a minimum.



OPEN

3 When all jacket pressure is removed, the tube is forced completely off the core and the valve assumes its wide open position. Full flow capacity with minimum pressure drop is assured. As Flexflo employs no hinge-pins, guides or other metallic moving parts, no troublesome problems of corrosion or wear are encountered. It cannot stick, wedge or slam.

GROVE

Grove Flexflo Valves and Regulators are adaptable to air, gas, oil, water and other fluids at temperatures to 150° F. Available in iron or steel, sizes 1" to 12", for working pressures up to 1500 psi. Wire or write for full details.

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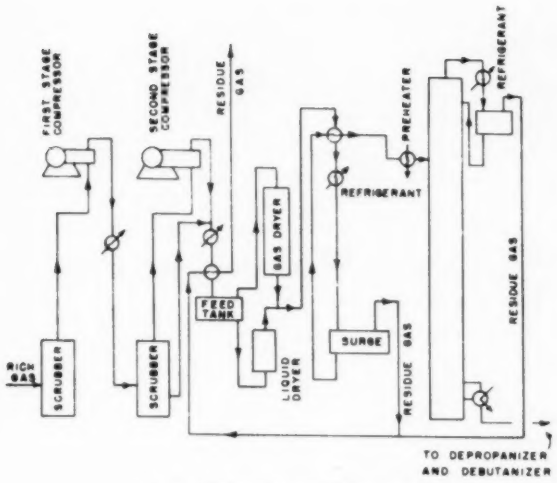


Fig. 3—Refrigeration-compression system.

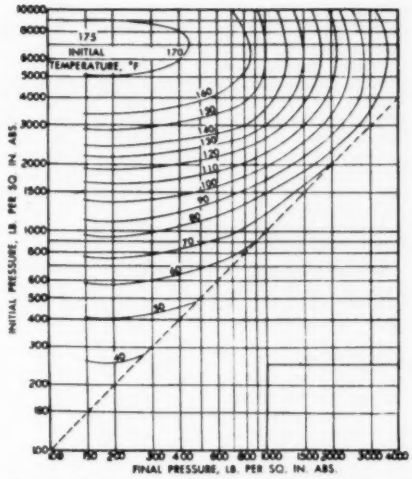


Fig. 4—Permissible expansion of a 0.6-gravity natural gas without hydrate formation.

Uses of the chart: This figure may be used to solve two types of problems.

Example.—How far may a 0.6-gravity gas at 2,000 lb. pressure and 100° F. be expanded without danger of hydrate formation?

Answer.—From Fig. 4, answer is 1,050 psia.

Example.—How far may a 0.6-gravity gas at 2,000 lb. and 140° F. be expanded without hydrate formation?

Answer.—From Fig. 4 it is learned that hydrates will not form upon expansion to atmospheric pressure.

Example.—A 0.6-gravity gas is to be expanded from 1,500 to 500 lb. What is the minimum initial temperature that will permit the expansion without danger of hydrates. The answer, from Fig. 4, is an initial temperature of 90° or above.

Example.—A 0.6-gravity gas at 10,000 lb. and 140° is expanded freely and adiabatically: (1) At what lower pressure will the temperature become 140° F.? (2) At what pressure would hydrates be likely to appear if sufficient water is present?

Answer.—From Fig. 4 is seen that (1) is 4,500 lb. and (2) 1,150 lb.

the production of liquid products, without chemical change, is normally referred to as a natural-gasoline plant. Besides the natural gasoline, however, such products as ethane, propane, butane, isobutane, isopentane, motor fuel, kerosine, and residual fuel oils are made from the heavier hydrocarbons which have been extracted from the raw-gas stream. The result is that where natural gas is processed in a gasoline plant, it must be considered as one of a number of valuable plant products.

As might be expected, there is a wide variation in the individual plant processes. Depending upon the primary means of initial separation from the raw gas stream, we can classify these as (1) absorption plants and (2) refrigeration plants.

Absorption plants.—Here the heavier hydrocarbons are removed from the incoming raw gas by contacting with a light absorption oil very similar to kerosine. A flow diagram of such a plant is illustrated in Fig. 1. The ramifications of this plant are many, with the primary purpose of each being either to absorb more and/or to retain more of the absorbed products. The absorption plant is adaptable to most any raw-gas condition, but to the gas pipe line can have one distinct disadvantage, this being that in the absorber the temperature of the gas and oil is raised by the heat of absorption. The oil is carrying an appreciable quantity of water, either in solution or suspension, which it gets from the stripping steam in the still. The residue gas from the absorber becomes saturated with water at this elevated temperature. If this

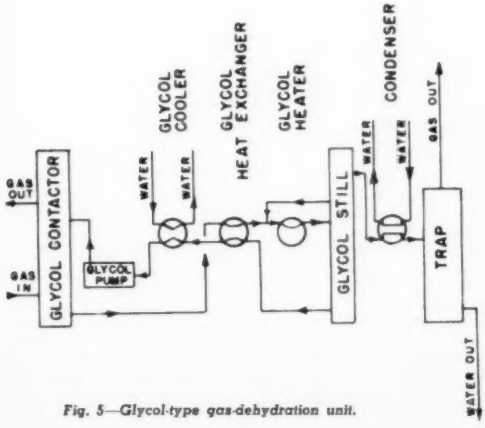


Fig. 5—Glycol-type gas-dehydration unit.

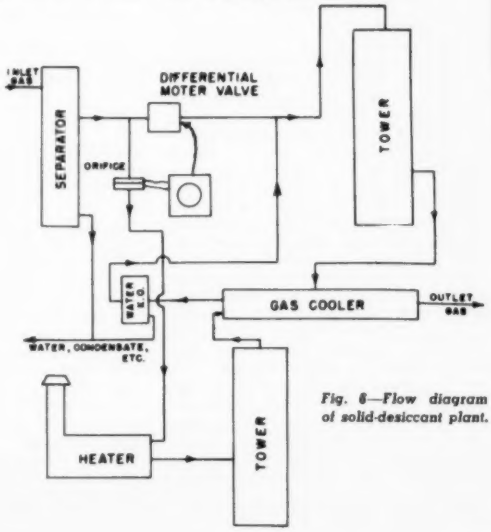


Fig. 6—Flow diagram of solid-desiccant plant.

residue gas is not dehydrated, it can be the source of a large quantity of liquid water in the gas pipe line.

If the residue gas is dehydrated without some form of cooling to compensate for this temperature rise, it will greatly aggravate the dehydration problem. It is possible to use dry gas for stripping in the still or to remove the water from the lean oil before returning to the absorber in order to prevent the residue gas from increasing in water content over that of the inlet gas to the absorber.

Refrigeration plants.—Two different types of refrigeration systems are illustrated in Figs. 2 and 3. These systems are not as adaptable as the absorption system to all gases, being limited to gases which are classed as "rich" in liquefiable hydrocarbons.

The low-temperature-separator method of water and liquefiable hydrocarbon removal on high-pressure gas-distillate wells is a method that has gained relatively recent popularity. This method will not be elaborated on here. However, we should not overlook the fact that this method has the limiting feature of high-pressure drop.

Calculation of temperature and pressure conditions at which a particular gas will begin to condense hydrocarbons, commonly called "dew point," is a fairly complex calculation, well covered in the literature, and beyond the scope of this paper. However, it is fairly common practice to regard gas which contains not more than 0.2 gal. of gasoline per 1,000 cu. ft., by the standard N.G.A.A. charcoal test, to be acceptable for pipeline pressures up to 900-1,000 psi. without condensation.

While drip gasoline is an expensive nuisance to the gas pipe liner, it is liquid water that is his chief concern. Liquid water in the presence of natural-gas hydrocarbons and under certain temperature and pressure conditions may form a hydrate which is a solid ice-like material. Under extreme conditions these hydrates can pack severely enough to block a pipe line.

The chart "Water-Vapor Content of Essentially Nitrogen-Free Natural Gas at Saturation"* illustrates the water vapor capacity of a natural gas.[1] At a given temperature and pressure, the quantity of water shown is that when the system is at 100 per cent relative humidity. Water capacity decreases with increased pressure, temperature remaining constant or increases with temperature, pressure remaining constant. Composition of a gas affects its water capacity, but this effect is small and normally neglected. The chart is useful for three purposes:

1. To determine the extent of dehydration necessary for a particular gas.; i.e., if gas is going into a pipe line operating at 800 psi. where ground temperatures are such that the gas can be expected to reach a temperature of 30° F., to what extent must the gas be dehydrated to prevent formation of liquid water?

From the curve, the 800-psi.-pressure line and the 30° F.-temperature line cross, showing that a saturated gas under these conditions holds 7.5 lb. of water per million cubic feet. To prevent the condensation of liquid water, this gas should be dehydrated to a vapor content of not more than 7.5 lb. per million cubic feet.

2. To determine the amount of water to be removed in dehydration: i.e., if the above gas was entering a dehydration plant at 850 psi. and 95° F., how much water must be removed?

The curve shows a saturated gas at 850 psi. and 95° F. to hold	62.0 lb. H_2O per M.M.c.f.
at 800 psi. and 30° F. to hold	7.5 lb. H_2O per M.M.c.f.
Water to be removed	54.5 lb. per M.M.c.f.

3. To predict the formation of hydrates. A gas under temperature and pressure conditions above the hydrate line will not form hydrates. A gas under temperature and pressure conditions below the hydrate line, and in the presence of liquid water, may form hydrates.

Data published by D. L. Katz[2] shows the permissible expansion of a natural gas without hydrate formation. (See Fig. 4.) This information is useful in determining the layout of a well-head installation on high-pressure gas wells to prevent hydrate formation when the gas is throttled to gathering system pressures. In gas-gathering systems, particularly, it is often necessary to provide heat to the gas to keep it above the hydrate point in order to reach a central dehydration plant.

There are three water vapor removal systems now in general use:

1. Liquid desiccant system.
2. Solid desiccant system.
3. Low-temperature separator.

Liquid desiccant.—This system has the advantage of operating on a continuous cycle. The gas is contacted in an absorber and the diluted desiccant is regenerated in a small concentrator. Fig. 5 is a flow diagram of a typical liquid system. The solid desiccant systems operate on a cycle type process where two or more contactors alternately dehydrate the gas and are then regenerated by using hot gas or superheated steam. Fig. 6 is a typical flow diagram on a solid type unit.

In small installations, the liquid system will operate with little labor expense without the necessity of putting in a complicated system of controls. In the larger systems, the cycle controllers used to make the solid desiccant units automatic are a smaller relative part of the investment so that there is small difference on an economic basis.

The liquid desiccants in popular use are usually one of the glycols. The chief difficulty with the glycols is getting sufficient reconcentration without decomposition in order to get large dew point depressions. In some cases, reconcentration under vacuum gives good results.

Normally, the higher pressure gas transmission lines require dew points (point at which water will begin to condense) in the neighborhood of 30° F. or less. With glycol this corresponds to a maximum allowable inlet gas temperature to the dehydrator of about 80° F. Recent developments may allow slightly higher temperatures.

Solid desiccants.—The bauxite-type desiccants will give dew points in the 0° F. and under range and are satisfactory to about 95° F. At this temperature they fall off rapidly in capacity. They are also subject to "dusting" with changes of velocity in the bed which, in the presence of the heavier hydrocarbons, will tend to cake, resulting in loss of capacity and increased pressure drops.

Recently, a beaded silica-gel type desiccant has been used. It will dehydrate at elevated temperatures, has good capacity, but is very sensitive to liquid water which causes disintegration of the beads. It has an affinity for hydrocarbons, which results in a liquid hydrocarbon recovery on the regeneration cycle. This liquid can be recovered and sold to help offset the cost of dehydration. The bauxites also have this affinity for the hydrocarbons, but to a lesser extent.

Pressure Drop

Pressure drop through a dehydration plant, like pressure drops through other equipment, causes increased horsepower requirements with an accompanying increased operating cost. Data in Fig. 7 illustrate the effect of

(Continued on page 89)

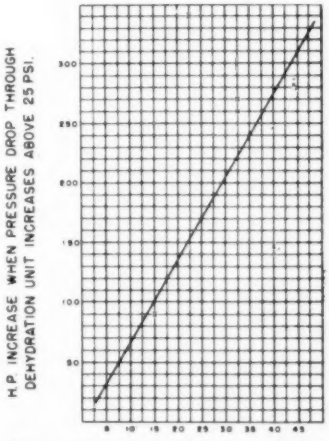


Fig. 7—Horsepower increase vs. pressure-drop increase (dehydration unit). The abscissa is the pressure-drop increase (dehydration unit) using 25-lb. drop as base. Compressing 100,000 M.c.f. per 24 hours from 475 to 875 psig.

*Reproduced, The Oil and Gas Journal, January 5, 1950, Pg. 59.

CORROSION and its control

Bimetallic Corrosion

CORROSION whose primary cause is the potential difference between different metals in soil, water, or other conductive electrolytic media is known as galvanic corrosion. The electrochemical series is much cited in the discussion of this type of corrosion, but reference thereto cannot adequately explain all the instances of occurrence and nonoccurrence of galvanic action, for two chief reasons.

First, the electrochemical series gives the potentials exhibited by the various metals under one very specific set of conditions. Each metal is compared to a hydrogen electrode, and each metal is placed in a standard solution containing its own ions, and no other metallic ions: furthermore, the values are determined at standard temperatures and pressures. If these conditions are duplicated in a bimetallic cell—i.e., if each electrode is placed in a standard solution of one of its own salts, the two solutions being separated by a membrane or barrier—then the potential difference measured between them will be equal to the difference of their respective potentials as indicated in the series.

In any other solution or combination of solutions, at any other temperature, the potential difference will be something else. Zinc and ferrous iron, for example, show a difference of 0.33 volt in the series, the zinc being anodic. Yet in hot water these potentials have been observed to reverse, the zinc becoming cathodic with respect to the iron. Again, iron is indicated as being slightly anodic with respect to cadmium. But if a solution is used in which the concentration of the iron ion is much greater than that of the cadmium ion, the reverse is true. From this latter example it is easy to see that the changes taking place in a solution as corrosion proceeds may themselves bring about a shift in the relative potentials of the two electrodes.

For a given corrosive medium it is possible to establish a series in which the various metals are ranked according to their potentials in that medium. Such a table is known as a galvanic series; several have been determined for specific media; for example, sea water.[1]

Another explanation for the failure of the electromotive series to tell all about corrosion is that the potential difference between two metals is merely an indication of the initial tendency toward corrosion. The actual rate of corrosion is determined jointly by the magnitude of the current flowing and the electrochemical equivalent of the anodic metal. The current, in turn, is determined by the potential difference and the total resistance of the circuit. Even this does not tell much concerning the severity of the corrosion; for this depends upon the total current flow and also upon the area within which the anodic current is concentrated. For example, steel and iron are anodic with respect to copper and brass; a brass valve in an iron pipe will do no great damage to the pipe, because of the relatively large area of the anode; on the other hand, an iron valve in a copper line would be rapidly destroyed, if in a sufficiently conductive electrolyte.

The correct evaluation of the effects of all of the above mentioned factors still fails to appraise the situation in many cases. The potential difference in the specific medium, together with the total circuit resistance, determines the initial current; the current and the electrochemical equivalent of the anodic metal, together with its area, determine the initial rate of attack; but the reactions which take place on the anode, on the cathode, and in the electrolyte, after corrosion begins, may drastically alter the conditions.

ELECTROMOTIVE SERIES OF METALS

Metal—	Ion formed	Potential
Lithium	Li^{+}	+2.96
Rubidium	Rb^{+}	+2.93
Potassium	K^{+}	+2.92
Strontium	Sr^{++}	+2.92
Barium	Ba^{++}	+2.90
Calcium	Ca^{++}	+2.87
Sodium	Na^{+}	+2.71
Magnesium	Mg^{++}	+2.40
Aluminum	Al^{+++}	+1.70
Beryllium	Be^{++}	+1.69
Manganese	Mn^{++}	+1.10
Zinc	Zn^{++}	+0.76
Chromium	Cr^{++}	+0.56
Iron (ferrous)	Fe^{++}	+0.44
Cadmium	Cd^{++}	+0.40
Indium	In^{+++}	+0.34
Thallium	Tl^{+}	+0.33
Cobalt	Co^{++}	+0.28
Nickel	Ni^{++}	+0.23
Tin	Sn^{++}	+0.14
Lead	Pb^{++}	+0.12
Iron (ferric)	Fe^{+++}	+0.04
Hydrogen	H^{+}	0.00
Antimony	Sb^{+++}	—0.10
Bismuth	Bi^{+++}	—0.23
Arsenic	As^{+++}	—0.30
Copper (cupric)	Cu^{++}	—0.34
Copper (cuprous)	Cu^{+}	—0.47
Tellurium	Te^{++++}	—0.56
Silver	Ag^{+}	—0.80
Mercury	Hg^{++}	—0.80
Palladium	Pd^{++}	—0.82
Patinum	Pt^{++++}	—0.86
Gold (auric)	Au^{+++}	—1.36
Gold (aurous)	Au^{+}	—1.50

Ordinarily, there is a tendency for hydrogen to evolve at the cathode, and oxygen at the anode. If the rate of formation of hydrogen is slow, and no agency exists to remove it, a film of very high resistance may be formed, so that the corrosion rate is enormously reduced. Some metals and alloys—notably aluminum—form thin, insoluble, high-resistance oxide films when they are used as the anode in an electrolytic cell, to the extent that the corrosion rate drops to practically zero.

There are numerous other corrosion products, either in the form of films or deposits of greater thickness, which can stifle corrosion by increasing the resistance of the cell formed; a high current density is employed in the initial stages of cathodic protection in sea water in order to build up a calcareous coating of high resistance on the cathode, by the deposition of calcium and magnesium salts from the sea water itself. The possible effect of changes is the concentration of certain ions in the solution has already been mentioned; this could be expected to take place only in confined regions in a liquid, but it may prove very important in an electrolyte like the soil.

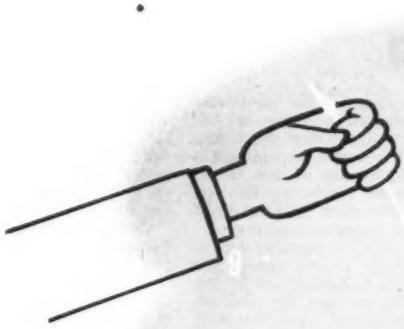
From all of the above complexity and confusion it is difficult to draw any simple conclusions: however, it is well, in the absence of specific knowledge of the behavior of given metals and alloys, and particularly in the absence of information as to the environment in which a structure is to be exposed, to avoid the use in electrical contact of metals which lie very far apart in the electrochemical series; where dissimilar metals must be used, it is advisable to separate them electrically if practical; and it is always good practice to make the anodic metal the one with the larger exposed area.

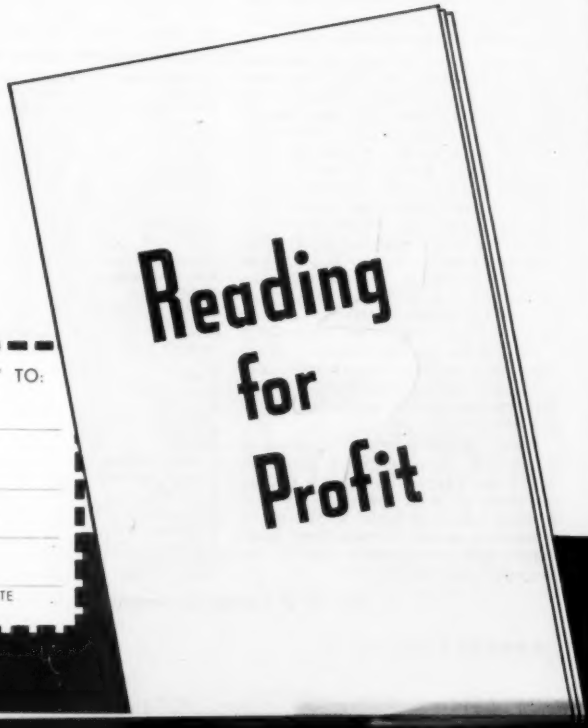
Reference

1. Unlig, Corrosion Handbook, p. 416 (Wiley).

Part 22 of a series by Marshall E. Parker, consulting engineer, Houston.

You Can't Hold Back the Clock . . .





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Five Years of Gas Injection

(Continued from page 59)

As previously mentioned, credit for all of the increased oil production cannot be given directly to the gas-injection program. It has been definitely determined that in order to obtain maximum benefits it is necessary to perform remedial work on the producing wells to eliminate plugging and sealing action of paraffin and salt deposits that form in the well bores.

The most effective method developed to date to recondition the well bores continues to be to clean out the wells and acidize with 4,000 gal. of 15 per cent of 8,000 gal. of 7½ per cent acid. Another method used by some operators is to reshoot the pay section with an untamped shot using from 1½ to 2½ qt. per foot of pay section. A third method, which is cheaper but less effective, is to substitute fresh water for the acid, using 100 to 150 bbl. for each well.

Prior to commencement of gas injection, remedial work was not generally considered to be worth while in this area due to the short duration and marginal increases obtained. However, since the start of gas injection, there are numerous leases in the area that obtained substantial oil increases that have been sustained for 2 to 2½ years before additional remedial work was necessary. Increases following remedial work on wells offsetting input wells are usually of a more sustained nature and often continue to increase for several months. Wells more remote from the injection wells have a tendency to decline at a more rapid rate following remedial work. This characteristic tends to prove that the injected gas is definitely instrumental in sustaining the oil production.

A most important factor with regard to the success of the gas-injection program is the fact that there has been no appreciable change or decline in the over-all efficiency of the project as indicated by the produced gas-oil ratio. During the past year when the oil production has been assuming a new decline trend, for the most part the produced gas has been following the same trend in that it has declined at a rate comparable to the oil production.

In a number of cases certain wells have suddenly dropped in oil production. Investigation has shown that a similar drop in gas production has taken place at the same time. From this it is evident that the gas, as well as the oil, is being prevented from entering the well bore by cavings, paraffin, and/or salt accumulations. Experience has shown that following cleanout and acid operations or water treatment on such wells both oil and gas production show a comparable increase and return to normal. It, therefore, can be concluded that the decline in oil production was due primarily to a physical condition of the well bore and not due to decreased efficiency of the gas drive.

Progress and Results

Prior to commencement of gas injection, a system of periodically testing individual wells was inaugurated. Several tests on each producing well were made prior to repressuring; and since gas injection has been started, this periodic testing has been continued. This work has been found to be very important in evaluating the success of this type of repressuring project. It gives the most accurate control possible in determining the direction, extent, and rate of migration of the injected gas in addition to the effect on the produced oil and efficiency being obtained from the injected gas.

Presented in Fig. 1 are curves showing oil and gas production, produced gas-oil ratios, and their expected normal declines. The effect of repressuring on each of these items is designated by the shaded areas. The produced oil, after reaching a peak in September 1943, followed a very steep decline in the amount of some 18 to 20 per cent per year, regardless of the fact that during this period some remedial work was performed and several new wells drilled. It was approximately 6 months after gas injection had been commenced before any indication of the retarding of the produced-oil decline was discernable.

The trend of the three factors, the produced, injected, and net gas-oil ratios, is shown in Fig. 2. The injected gas-oil ratio has followed a steady uptrend since the commencement of the project and at the present time is 2,019 cu. ft. per barrel.

The net gas-oil ratio declined the first 2 years from 1,344 to 512 cu. ft. per barrel, averaged approximately 700 cu. ft. per barrel the third year, and approximately 900 cu. ft. per barrel the fourth and the first half of the fifth year. Currently it is on a decrease, reflecting the recent increase in the rate of gas injection. Since the start of the project it has averaged 870 cu. ft. per barrel, which represents a small amount of gas being permanently removed from the reservoir with each barrel of oil produced.

During the last half of 1950, when the third round of injection wells was placed in service, input gas rate was increased and currently approximately 20,000 M.c.f. per day of gas is being injected. This trend is presented in Fig. 3, along the curves designating the amount of returnable residue, makeup gas purchased, and the per cent of produced gas injected. It is of importance to note that the returnable residue available for repressuring, after extraction losses and fuel consumption, was increased from slightly over 8,000 M.c.f. per day when gas injection was first commenced to a peak of 17,000 M.c.f. per day during April, May, and June 1949.

Currently the returnable residue is averaging approximately 15,000 M.c.f. per day. This has been due, for the most part, to the increased gas production; however, a gas-conservation program initiated in 1946 has likewise had its effect in providing additional gas for injection. No makeup gas of any consequence was purchased until the fall of 1947 and since then a total of 3,500,000,000 cu. ft. have been purchased, which is 14.75 per cent of the total gas injected.

Presented in Fig. 4 are four curves showing (1) cost of repressuring per increased barrel of oil produced, which amounted to 42 cents the first year, 21 cents the second year, 11 cents the third year, 7 cents the fourth year, and 9.5 cents the fifth year; (2) the volume of gas injected per barrel of increased oil which averaged 15.2 M.c.f. during 1946, 8.2 M.c.f. during 1947, 4.3 M.c.f. during 1948, 3.1 M.c.f. during 1949, and 3.6 M.c.f. during 1950; (3) the repressure cost per thousand cubic feet of gas injected which has been relatively constant at about 2.6 cents per M.c.f. of gas since the project has been in operation; and (4) the cost of repressuring per barrel of oil produced, which amounted to 1.1 cents the first year, 2.5 cents the second year, 3.6 cents the third year, 3.4 cents the fourth year, and 4.5 cents the fifth year.

In addition to the very substantial benefits obtained from an oil-production standpoint, there has been an increase in the gasoline, butane, and propane production due to the increased gas production. Currently the revenues received by the operators from these increased liquid hydrocarbons are approximately 30 per cent greater than the cost of operating the project, and since the project started they have exceeded the expense of operation by $78,000.00. Fig. 5 shows the increased gasoline production due to repressuring based on test-car gallons per thousand determinations along with the estimated increased butane and propane production. With few exceptions, monthly gasoline, butane, and propane production due to repressuring has continually increased and at the present

Year—	Total oil production in barrels	Oil above normal decline in barrels	Per cent of oil above normal decline
1946	3,140,601	89,276	2.84
1947	3,740,139	435,674	11.65
1948	4,033,247	1,296,738	32.15
1949	4,310,474	1,997,814	46.35
1950	3,788,287	1,793,618	47.35
1951 through March	877,213	425,713	48.53
Total	19,889,961	6,038,833	30.36

time approximately 57 per cent of the gasoline production can be attributed to gas injection.

It was originally thought that the gasoline content of the produced gas would show a marked decrease due to the injection of the dry gas into the reservoir. This has not been the case, however, as shown by the average gallons per thousand content of the produced gas in 1950, so outside of the first year there has been very little change in the gallons per thousand content of the produced gas.

The diluting effect of the dry gas on the gallons per thousand content has not been so great as was originally expected. At the same time that injection started the gallons per thousand content was 2.40 and during 1946, averaged 2.45. Since then it has averaged 2.161 in 1947, 2.160 in 1948, 1.996 in 1949, and 2.051 in 1950. From this we can see that after the first year very little change has been experienced in the gallons per thousand content of the produced gas.

After 5 years of gas injection, the project is proving more and more worth while. All of the major investment items including the two repressure plants and field system to serve the 162 input wells are in operation and future investment costs will be nominal. Since the start of the project 30.36 per cent of the total oil produced has been above the normal decline, and during the first 3 months of 1951, 48.53 per cent of the oil produced has been above the normal decline curve. A secondary decline trend is being established at a rate approximately the same as the normal decline.

Watkins Operators' Committee

SUCCESS with the repressuring of West Pampa pool led to the decision to carry out similar operations in nearby Watkins pool. Located northwest of West Pampa pool, Watkins is comprised of 19,200 acres and 1,302 wells. Combined operations of the two pools from the world's largest repressuring project. Operations of the Watkins venture are under the Watkins Operators' Committee.

Following the committee's annual meeting in May 1950, construction of the field distribution system, Watkins repressure plant, and Crawford repressure plant was commenced. By the end of September the Watkins plant and field system were complete and in October 1950 the first input well was placed in service. By November 1950 all of the 82 "first round" input wells had been converted and 40 miles of new gas lines constructed. Fluid-level depression tests were run on all of the wells at the time they were placed in service to be certain that the injection gas was entering the oil pay section.

Initially the rate of injection was limited to approximately 30 M.c.f. of gas per injection well per day due to the limited capacity and availability of repressure gas from the Watkins plant. However, in March 1951, the Crawford plant was completed which made it possible to increase the rate of injection to approximately 100 M.c.f. of gas per injection well per day.

Gas injection has been under way since October 1950, but no definite changes in the producing characteristics of the individual wells or leases have been noted, nor have they been expected due to the relatively small volume of gas (2,400 M.c.f. per day or 30 M.c.f. per well per day) that was injected into the reservoir during the first 5 months. For all practical purposes actual gas injection of any consequence did not commence until March 1951, at which time the Crawford plant commenced operation and daily input was increased to approximately 8,200 M.c.f. of gas per day or an average of 100 M.c.f. per well per day. Furthermore, no appreciable benefits should be expected until the project has been in operation for from 1½ to 2½ years.

With both plants in operation it is planned to select a "second round" of approximately 68 to 70 additional input wells to be placed in operation this summer or as soon as sufficient gas is available.

These 68 to 70 wells will increase the number of input wells from 82 to approximately 150, which will result in an input well density of 1 input well per 78.5 acres or 1 input well per 6.6 producing wells. Of greatest importance is the fact that this density proved very effective in the West Pampa Repressuring Association area during the development phase and should prove beneficial in the Watkins area.

During the year considerable progress was made in improving the lease and field gathering systems. Several leases previously not connected to the gasoline plants were connected and on other leases separate gas-gathering systems were installed.

Production records of oil and gas dating from 1943 for oil and 1944 for gas have been accumulated and gas-oil ratios have been calculated for the 87 leases in the project. A similar record of the injected gas is being kept. Curves showing oil production, gas production, gas-oil ratios, and injected gas have been drawn and normal decline curves developed on leases which have been established a definite decline trend.

Data on individual wells showing location, elevation, pay section, casing point, shot records, etc., have been assembled on all of the wells in the project. Oil and gas tests of each well in the project are being accumulated and recorded in well test ledgers. The map of the area has been revised and is kept posted up to date.

Keeping Control Valves On Stream

(Continued from page 61)

these parts by welding. Seats and plugs which are worn and nicked are refaced several times before replacement and, when refacing is no longer possible, they are replaced by new parts. If a stem is pitted, corroded, or eroded, it is replaced and no attempt is made to resurface, since an absolutely smooth surface is mandatory to assure freedom from leaks and friction.

Protection.—Every effort is made to prevent both internal and external corrosion by having valve superstructures painted, and by coating all external threads which might rust with rust-preventive coating or heavy grease.

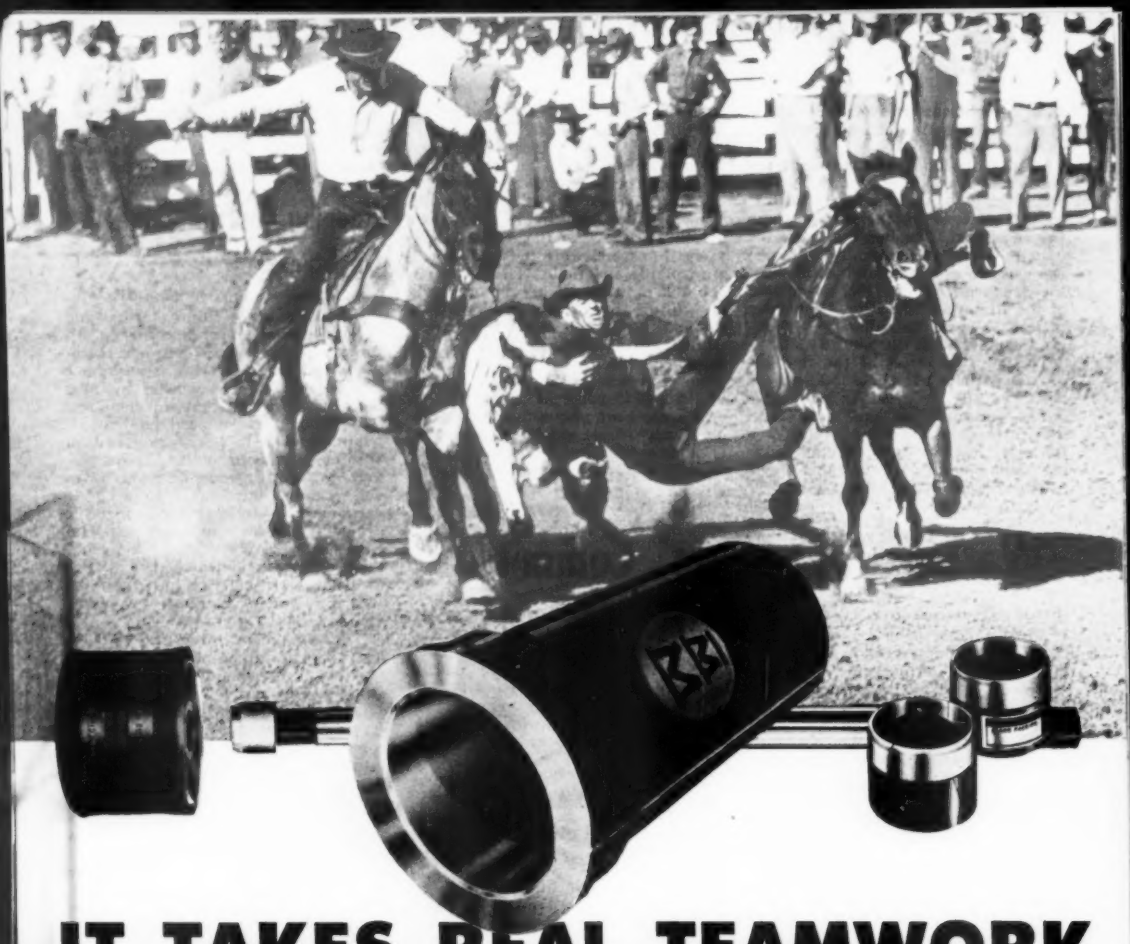
Cabinets to enclose valves are not used because they make casual inspection impossible in the course of other duties, and also make it difficult to detect leaks in the early stages. With steam, they entrap water vapor and hasten valve deterioration. However, valves bodies are frequently steam traced and enclosed where there is danger of freezing. When this arrangement is used, the valve top is completely exposed for inspection so that leaks can be quicky detected.

Stuffing-box packings. — These are carefully inspected for leakage. Since leakage is invariably due to improper or worn packing, or improper lubrication, the stuffing is continually maintained with packing material suitable for the prevailing operating conditions. Replenishment is handled by adding a new ring at intervals rather than unpacking and replacing all of the rings. The addition of a single ring or top replaces the wearing away that occurs with the passing of time. This prevents leakage and tends to retain the solid compact shape of the packing when pressure is applied by the stuffing-box nut. On occasions, however, the stuffing box is completely repacked.

The lubricator and isolating valve are also checked periodically. The proper lubricant for a given service is always used, and the stuffing box is replenished with it, as required.

Valve-travel adjustment.—Stem and plug are checked for full travel within the correct operating range. To meet emergency or special conditions, however, the superstructure my occasionally be adjusted so that only partial travel is obtained. On the other hand, adjustment is occasionally made so that full travel is obtained with less than the specified air pressure range to accomplish tighter than normal seating.

Proper specification as well as prac-



IT TAKES REAL TEAMWORK

to wrestle steers . . . and to assure *efficient* slush pump operation

Barehanded throwing of wild steers is so daring and dangerous a sport that it long ago became the "big wallop" of every rodeo. Successful steer wrestling demands precision teamwork by hazer, wrestler, and horses.

Efficient slush pump operation also requires precision teamwork. Piston, Rod, Liner and Packing must be in perfect alignment, have perfect fit, and work together with perfect mechanical precision! Valves must be rugged and efficient.

We have perfected the new MISSION "Super Service" Liner . . . accurately bored, ***induction*** hardened to ***uniform*** case thickness, precision honed, and "Satin Finished" . . . to enable you to obtain the same top quality in liners that you obtain in MISSION Pistons, Rods, Packing and Valves. These products constitute a perfectly mated "MISSION team" of expendable slush pump parts, ***unbeatable*** for economical slush pump service. Your supply store handles them . . . Mission Manufacturing Co., Houston, Texas. Export: 30 Rockefeller Plaza, New York. European Address: London, England.

Mission Silver Top Valve for Normal Pressures

Mission Super-Service Valve for High Pressures

MANUFACTURING CO

tical and orderly application of maintenance procedure at Bayway refinery pays off. Operations are carried out with a minimum of interruptions to processing. Shutdowns due to faulty valves are rare, and the over-all cost of process regulation has been kept at a reasonable and predictable figure.

Packers for Dual Completions

(Continued from page 72)

ever, the more complicated the installation, the greater the possibility of error or failure of some individual piece of equipment. The simplest installation which will meet requirements will be the most efficient, as well as the most economical.

Some attempted dual completions have failed because of insufficient advance information or incomplete planning; attempts have been made in wells entirely unsuited for this type of operation, due to formation conditions or reservoir limitations. These failures have contributed to some prejudice against all dual completions which is not supported by the evidence being built up daily by the many wells being produced efficiently and economically in this manner in many fields.

One example of the progress made in practical and successful dual completions may be found in the fact that conservation authorities in several of the major oil-producing states now grant blanket approval for such completions in certain specified zones of certain fields, (under specific restrictions, of course), whereas individual hearings for each well were formerly required before issuance of permits.

Recognition of the requirements resulting from full mobilization will undoubtedly instigate further study of this question by conservation engineers, who protect our natural resources from waste and inequitable depletion, to the end that such policies may be further liberalized and simplified where conditions will permit, in order that this means of stretching our supply of critical materials may become more easily usable, especially by the operator.

BOOKS

OIL PROPERTY VALUATION, by Paul Paine. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York. 204 pp.

Since published accounts of the valuation of oil properties have been concerned chiefly with the important element of the oil and gas contents of lands, and less attention has been given to those other influences which affect the value of the oil and gas, to the various valuation methods appropriate to different circumstances, and to the forms in which oil properties occur, the aim of this book is to help close that gap, especially for the younger engineers. It reviews the meaning and scope of valuation in the oil business, the factors which enter a valuation, and the methods of applying these.

FOSTER FLOW TUBE*

(Gentile Patents)

Less Throat Constriction

Less Flow Restriction

Study the above picture of the Foster Type V Flow Tube which operates on the viscous drag principle. Note the almost straight-through construction. There's only a slight throat constriction. And the same minimum throat constriction is typical of the Type D Flow Tube which operates on the principle of dynamic impact. *Both types offer minimum resistance to flow.*

You know what this means. Negligible unrecovered head loss in the flow of the liquid or gas. Less power required to push it along.

"Good," you say, "but what about accuracy?"

The Foster Flow Tube will measure the flow of liquids or gases with an accuracy at least comparable to that of conventional primary devices and, in most cases, with considerably greater accuracy, because it can readily be installed in that section of the hydraulic system where flow conditions are uniform and steady. Thus, with this unique Flow Tube, you can combine accuracy with neglible head losses—accuracy with compactness—accuracy with ease of installation.

Write us in detail about your problem, giving both processing and installation requirements. We have several types and units in all commercial pipe sizes.

*A Proved Flow Tube Added to Foster Line of Regulating Valves

FOSTER ENGINEERING Company

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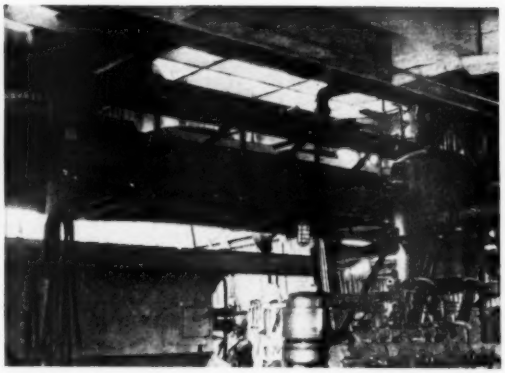
PRESSURE REGULATORS...RELIEF AND BACK PRESSURE VALVES...CUSHION CHECK VALVES...ALTITUDE VALVES...FAN ENGINE REGULATORS...PUMP GOVERNORS...TEMPERATURE REGULATORS...FLOAT AND LEVER BALANCED VALVES... NON-RETURN VALVES...VACUUM REGULATORS OR BREAKERS...STRAINERS...SIRENS...SAFETY VALVES...FLOW TUBES

Cooling water from the engine jackets enters the steam separator via a tangential connection. Controls on the separator maintain constant liquid head on the system.



This view of a portion of the cooling system shows the aerial coolers located above the rig's draw works. The steam separator may be seen at the extreme right.

Jacket-Water Temperature Control

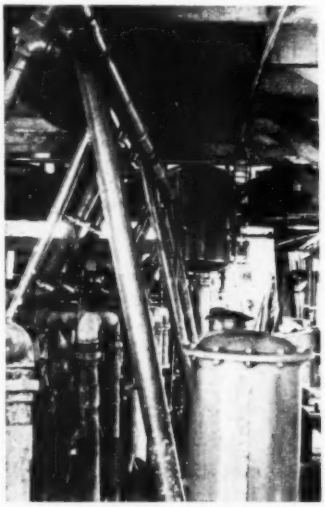
Signal Oil & Gas uses vapor-phase cooling on drilling engines

A METHOD of engine jacket-water temperature control which is new to the oil-industry drilling department is being used by Signal Oil & Gas Co. at Huntington Beach, Calif. The system, developed in Los Angeles for marine and large stationary engines, is called "vapor-phase cooling" because only the steam, or water vapor flashing from the hot jacket water is cooled to condensate. The unit at Huntington Beach has been installed recently on the floor of the derrick to control jacket-water temperature on four 300-hp. natural-gas-fueled engines.

This method of jacket-water temperature control does not use conventional radiators or air-circulating fans common to drilling engines. Function of the vapor-phase cooling method is to maintain jacket water at a constant temperature regardless of speed or load on the engines. The lowest temperature that can be maintained with this system is the boiling point of the jacket water at the given back pressure for the individual system.

Vapor-phase cooling employs a closed system consisting of a flash steam separator set on an 8-in. standpipe resting on an 8-in. header in front of the engines on the skid members where the radiators had been mounted. Above the engines is a 4-in. header connected to the side of the flash steam separator and having connections at intervals to which the engine-jacket outlets are attached. Each engine water-pump suction is connected to the horizontal 8-in. header to circulate the water contained in the jackets, the header, and in the lower part of the steam seperator.

Steam, or water vapor as the case may be, is removed from the top of the flash separator through a 6-in. line which leads to an aerial condenser supported on brackets above the rig draw works. The 6-in. line has suitable fittings for connections leading to six separate low-pressure steam turbines which operate exhaust fans which pull air upward through six sections of aerial coolers to condense the vaporized water.



Water header leading to the steam separator. Diagonally placed pipe legs support the header.

The turbines are designed to operate on extremely low pressure. They can operate on any quantity steam at pressures of an ounce or so up to the full pressure on the system.

When the temperature of the jacket water is at 212° F. (sea-level locations) generated steam flows from the separator through the aerial coolers where it is condensed. Condensate flows by gravity from the cooler into the flash steam separator below the maintained water level. As the turbines are connected so steam enters the impellers first, the turbine exhaust flows directly to the coolers to be condensed.

Speed of the fans is governed by the volume of steam released from the jacket water in the flash separator, so, therefore, the greater the quantity of steam, the greater the speed of the turbines and the greater the volume of air drawn through the aerial coolers.

No outside power is necessary to maintain circulation of air through the coolers, and when the engines are idling, steam volume is at a minimum, and only a minimum volume of cooling air is required for the steam condensers. Each of the steam turbine fans is in a separate cell with adequate fan shrouds to control the amount and direction of air drawn through the condensers.

Oil temperatures in the crankcases of the engines are not substantially higher than with conventional cooling, but average at or above the vaporization point of contaminating gases. Jacket temperature of 212° F. keeps the acid products of combustion above the condensing point (approximately 210° F.) hence these

contaminants flow outward with the exhaust instead of condensing on the lower end of the cylinder and find their way into the crankcase. Crankcase oil in these engines begins with 30 SAE grade, and the viscosity is checked frequently to observe the rise in "weight." As the oil approaches the range of light 50 SAE, it is replaced with a fresh supply.

Crankcase temperature tests on continuous operation without vapor-phase cooling, and with conventional radiators showed that temperatures rose and fell with the speed of idling of the engines, ranging from a top of about 215° F. down to 150° F., depending upon the intervals between high speed and idling. After vapor-phase cooling, tests with the same recording instrument showed that oil temperature was constant at approximately 215° F. Examination of crankcase oil running at the constant temperature showed no sludging, nor were there indications of breakdown or deterioration of lubricating quality.

Useful horsepower in the amount formerly required to drive the radiator fans is available for draw works, mud pumps, or other operations. Splashing of waste, or overflow water from radiator filler caps is eliminated, thereby preventing shorting out of magnetos.

The flash steam separator, or what is called the vapor-phase unit, contains a liquid-level controler on a makeup line to maintain a constant level in the cooling system. Low-level alarm sounds if the water falls below the point of makeup. The standpipe upon which the flash steam separator is installed extends into the unit forming a sludge and scale chamber to trap any solid material that may drop from the jackets. A blow-down line connected to this end of the flash steam separator permits elimination of solids.

Licking Liquids in Gas Pipe Lines

(Continued from page 80)

increased pressure drop on horsepower requirements for compression of natural gas. The liquid systems have relatively small pressure drops determined primarily by the liquid head over the trays in the contactors. The solid types have pressure drops determined by the piping, valving, and the depth and type of bed.

A major portion of the pressure drop through the solid-type units is a result of normally taking the regeneration gas (see Fig. 6) off the main stream before a differential valve, through the heater, the regenerating bed, the cooler, and back into the main stream before it enters the drying bed. If the unit is operating at sufficient pressure and the regenerating gas cooler can be assured of cooling this gas to the order of 90° F., it can then be put back into the main stream on the outlet of the plant and still assure a 30° F. dew point. This will decrease the pressure drop by an appreciable amount.

In the solid-type units there are a number of different tower designs being used:

1. The conventional vertical tower with either a single, or multiple, bed(s) in which the gas enters one end of the tower and leaves at the other end.

2. So-called radial flow tower in which the gas enters the side of the tower, flows around an inner shell, passes through the bed into a center core, and out the bottom of the core.

3. A horizontal tower divided into several compartments with an individual inlet and outlet for each compartment.

4. It is reported there is now a spherical tower under development.

The objective of each type of tower is to give uniform flow through the bed on the drying and regenerating cycle in order to use the maximum capacity of the desiccant, to provide easy access for filling and emptying the unit of desiccant, and to give a minimum of pressure drop.

Summary

The liquefiable hydrocarbons are removed from natural gas for one or a combination of these reasons:

1. Because it is economically feasible to recover the liquefiable hydrocarbons.

2. To meet contractual specifications on the residue gas.

3. To prevent the formation of liquids in the gas pipe line.

The removal of water vapor from natural gas is done for one or a combination of two reasons:

1. To prevent the formation of liquid water at any point in the pipe line which has the accompanying danger of the formation of hydrates.

2. To meet contractual obligations.

References

1. McCarty, Boyd and Reid, Journal of Pet. Tech., A.I.M.E. V. 2, 241-242 (1950).
2. Katz, D. L., A.I.M.E., Tech. Pub. 1748 (1944).

Exploration and Drilling In San Juan Basin

(Continued from page 67)

50 cents per acre for the first 3 years, and 25 cents per acre for the fourth and fifth years; if preference rights are exercised the rental will be 50 cents per acre per year for the next 5 years. All the above land must not be on any known or producing structure, as lands of this nature require competitive bidding to obtain leases.

Leases on public lands, which have been purchased by the United States through agencies such as the Soil Conservation Service, are the same type as that issued on the public domain lands, with certain other obligations such as a drilling commitment.

Indian lands.—A substantial portion of the San Juan basin (about 38 per cent) falls in this category. There are three Indian reservations in the San Juan basin proper, the Ute to the north, the Apache to the east, and the Navajo to the west. These lands are known as tribal lands and each is governed by a tribal council with approval of their decisions resting with the Indian Affairs Commission in Washington.

Leases on these lands are secured by competitive bidding held by the various Indian Agencies. The leases are given for 10-year periods with $1.25 per acre yearly rentals to be paid in advance. Generally such leases call for the drilling of at least one well during the first 5-year period. Regulations provide for a limitation of 25,000 acres for each individual or corporation on any one Indian reservation in New Mexico.

State lands.—It is estimated that about 7 per cent of the land in the basin is state owned. The state will sell its lands to individuals but will retain all mineral rights.

The Commissioner of Public Lands, located at Santa Fe, controls the leasing of state lands. For the purposes of oil and gas leases these lands are classified as "restricted" or "nonrestricted." In the restricted areas, established by official proclamation, leases are obtained by competitive bidding at sales held on the tenth of each month at Santa Fe. Prevailing rental rates are set by the commissioner, and these rates range from 5 cents to $1 per acre. The leases are issued for a term of 10 years, a 5-year primary term and a 5-year secondary term. Generally the rental rate is doubled during the secondary term.

In the San Juan basin, all of San Juan County is now classified as temporarily restricted and leases are obtained by competitive bidding. There are certain small areas in this county, near production, which have been officially restricted, as well as one small area in McKinley County. The remainder of McKinley County and all of Sandoval and Rio Arriba counties are classified as nonrestricted, with leases obtained by application. All of San Juan and McKinley counties are in the 25-cents-per-acre rental area, whereas in Rio Arriba and Sandoval the prevailing rental is 10 cents per acre.

Railroad lands.—In the southwest part of the basin the Santa Fe Railroad owns a large amount of land. About 4 per cent of the land in the basin is owned by the railroads. In the past it has been the policy of the Santa Fe, through a supervising office in Albuquerque, to encourage the drilling of test wells. A lease may be obtained by drilling a well. Drilling must be commenced within 6 months, and the payment of 50 cents per acre annual rentals must be made. The Santa Fe has its own type of lease, which in addition to the drilling clause and regular one-eighth royalty, contains $100 per acre royalty payment out of an additional one-eighth on alternate 160-acre tracts.

Patented lands.—The remainder of the lands in the San Juan basin (about 6 per cent) are privately owned, including those lands patented out by the United States to individuals, Spanish grants, tax-deed lands, and county lands.

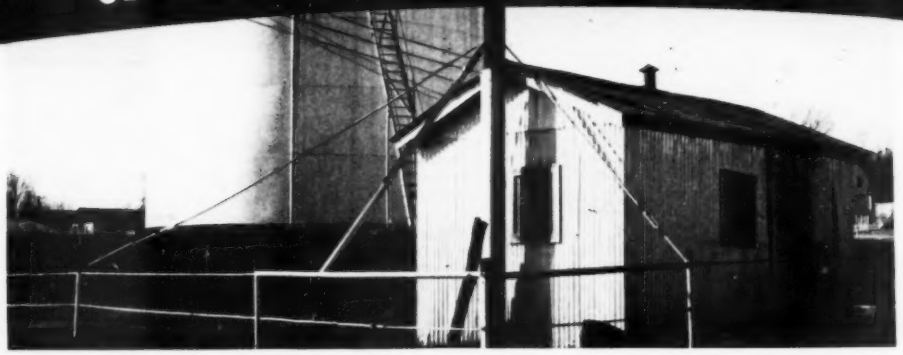
Some of the Spanish grants in the basin have been repurchased by the United States Department of Agriculture, with the minerals now controlled by the Bureau of Land Management under the Acquired Lands Act. The ownership of the privately owned grants that remain in the basin are generally complicated. It is our understanding that leases must be negotiated with trustees set up for the grants, although in a few instances complete ownership has passed to individuals.

References

The Oil and Gas Journal. San Juan Basin, May 27, 1948. Structures of the San Juan Basin, March 31, 1949. Developments in the San Juan Basin, June 23, 1949. All by Frank C. Barnes.

Guidebook of the San Juan Basin. Prepared by New Mexico Geological Society, November 1950. Available through Director, New Mexico Bureau of Mines and Mineral Resources, Socorro, N. M. $5. Chapter on Cretaceous Rocks of the San Juan Basin by Paul H. Umbach and chapter on the occurrence of gas in Cretaceous rocks by Caswell Silver principal references for this article.

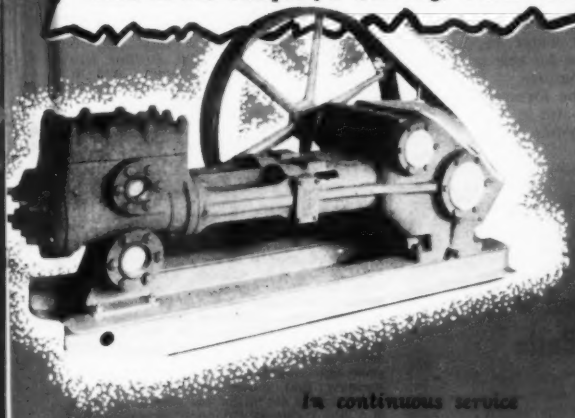
The Inside Story
OF AN AMAZING SERVICE RECORD



Faithful Automatic Pumping Station

from OIL & GAS JOURNAL

This pumping station of Deep Rock Oil Corp. near Drumright, Okla., has completed its twenty-second year of service. The installation utilizes the first automatic pumping units in Oklahoma, and works by maintaining a proper level of oil in the tank in the background. During the 22 years of operation, a little more than $500 has been spent in repairs, and the station now keeps an average of 3,000 bbl. of crude moving daily from Drumright field to the company's Cushing, Okla., refinery.



In continuous service since 1928, this Gaso Pump, electrically powered, is still delivering its full quota of dependable performance.

It is too bad that the picture above (reprinted from Oil and Gas Journal) could not have been taken with an X-Ray Camera, If it had you would see the "heart" of the pumping station that has established such an amazing performance record—a standard Gaso Fig 1508 pump installed in 1928 and in continuous service ever since. It is performance like this that explains why Gasos are the favorite pumps of pipe line men. May we send you a copy of our latest catalog?

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GASO PUMPS

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PROGRESS in METALS

by W. L. Nelson
Consulting Engineer

Alternate Steels During Metal Scarcity

WHEN a war shortage of alloy steels occurred in 1942, the steel industry, under the leadership of the American Iron & Steel Institute, evolved the NE (National Emergency) steels. The name "emergency" was psychologically good during the war period but it was not so good for peace time. To avoid this psychological reaction, these steels have been renamed "Tentative Standard" alternate steels. It is believed by most qualified steel men that many of the old NE steels were useful in their own right and that they need not be hampered by the appelation emergency.

The postwar situation, with regard to the use of the old NE steels, seems to have been (Cady, E. L., Materials and Methods, Jan. 1951):

1. The NE steels held about 15 per cent of the postwar market.

2. Much of the market they should have held was lost because men feared the implications of the word emergency.

3. Some of the market was lost because emergency steels are not "glamour" steels, the glamour being helpful in advertising.

4. Some fabricators lacked the equipment, the will, or the know-how to heat treat the NE steels for the results they needed. A generally cited figure is that while NE steel might need a temperature held within plus or minus 100° F., a high-nickel alloy might heat treat successfully even if the temperature went off 200° F.

5. There was, is, and always will be, a large market for which the higher-alloy steels can find no alternate materials.

Just how much of the market the leaner steels might have held if factors 2, 3, and 4 had been absent from the picture, no one knows. But it almost certainly would have been big enough to prevent us from going into a war economy with our supplies of some of the alloying materials already overstressed by the consumer product demand.

Table 1 indicates the standard series of steels and some of the alternates or replacements that are being used, and the compositions of the alternate steels suggested in Table 1 are shown in Table 2.

TABLE 1—STANDARD STEELS AND SOME ALTERNATES

Standard steel series	Tentative standard alternates
1300	8600
2300	8600 (to 2330 inclusive) 8700 8600 plus 5 points carbon (for 2335 and higher) Note: for low-temperature applications, consider possibility of using a heat-treated product.
2500	9300 (except for low-temperature and corrosive condition applications)
3100	8600 (to 3130 inclusive) 8700 8600 plus 5 points carbon (for 3135 and higher)
3300	9300
4000	9700
4100	8600 (to 4130 inclusive) 8700 plus 5 points carbon (for 4132 and higher)
4300	No generally applicable alternate
4600	8600 (for bearings RBEC 4700 may be necessary)
4800	No generally applicable alternate
5000	Special low alloy
5100	8600
52100	No generally applicable alternate
6100	8600
8600	No change
8700	No change
9200	8600
9300	No change
9400	8600
9700	No change
9800	No change

TABLE 2—COMPOSITIONS OF TENTATIVE STANDARD ALTERNATE STEELS*

Standard steel series	C	Mn	Mo	Ni	Cr
5045	0.43-0.48	0.70-0.90			0.55-0.75
5046	0.43-0.50	0.75-1.00			0.20-0.35
8615	0.13-0.18	0.70-0.90	0.15-0.25	0.40-0.70	0.40-0.60
8617	0.15-0.20	0.70-0.90	0.15-0.25	0.40-0.70	0.40-0.60
8620	0.18-0.23	0.70-0.90	0.15-0.25	0.40-0.70	0.40-0.60
8622	0.20-0.25	0.70-0.90	0.15-0.25	0.40-0.70	0.40-0.60
8625	0.23-0.28	0.70-0.90	0.15-0.25	0.40-0.70	0.40-0.60
8627	0.25-0.30	0.70-0.90	0.15-0.25	0.40-0.70	0.40-0.60
8630	0.28-0.33	0.70-0.90	0.15-0.25	0.40-0.70	0.40-0.60
8632	0.30-0.35	0.70-0.90	0.15-0.25	0.40-0.70	0.40-0.60
8635	0.33-0.38	0.75-1.00	0.15-0.25	0.40-0.70	0.40-0.60
8637	0.35-0.40	0.75-1.00	0.15-0.25	0.40-0.70	0.40-0.60
8640	0.38-0.43	0.75-1.00	0.15-0.25	0.40-0.70	0.40-0.60
8641	0.38-0.43	0.75-1.00	0.15-0.25	0.40-0.70	0.40-0.60
8642	0.40-0.45	0.75-1.00	0.15-0.25	0.40-0.70	0.40-0.60
8645	0.43-0.48	0.75-1.00	0.15-0.25	0.40-0.70	0.40-0.60
8647	0.45-0.50	0.75-1.00	0.15-0.25	0.40-0.70	0.40-0.60
8650	0.48-0.53	0.75-1.00	0.15-0.25	0.40-0.70	0.40-0.60
8653	0.50-0.56	0.75-1.00	0.15-0.25	0.40-0.70	0.40-0.60
8655	0.50-0.60	0.75-1.00	0.15-0.25	0.40-0.70	0.40-0.60
8660	0.55-0.65	0.75-1.00	0.15-0.25	0.40-0.70	0.40-0.60
8719	0.18-0.23	0.60-0.80	0.20-0.30	0.40-0.70	0.40-0.60
8720	0.18-0.23	0.70-0.90	0.20-0.30	0.40-0.70	0.40-0.60
8735	0.33-0.38	0.75-1.00	0.20-0.30	0.40-0.70	0.40-0.60
8740	0.38-0.43	0.75-1.00	0.20-0.30	0.40-0.70	0.40-0.60
8745	0.43-0.48	0.75-1.00	0.20-0.30	0.40-0.70	0.40-0.60
8750	0.48-0.53	0.75-1.00	0.20-0.30	0.40-0.70	0.40-0.60
E9310	0.08-0.13	0.45-0.65	0.08-0.15	3.00-3.50	1.00-1.40
E9315	0.13-0.18	0.45-0.65	0.08-0.15	3.00-3.50	1.00-1.40
E9317	0.15-0.20	0.45-0.65	0.08-0.15	3.00-3.50	1.00-1.40
9747	0.45-0.50	0.50-0.80	0.15-0.25	0.40-0.70	0.10-0.25
9763	0.60-0.67	0.50-0.80	0.15-0.25	0.40-0.70	0.10-0.25
9840	0.38-0.43	0.70-0.90	0.20-0.30	0.85-1.15	0.70-0.90
9845	0.43-0.48	0.70-0.90	0.20-0.30	0.85-1.15	0.70-0.90
9850	0.48-0.53	0.70-0.90	0.20-0.30	0.85-1.15	0.70-0.90

*Maximum sulfur 0.4 except for 8641 which allows up to 0.6. Maximum phosphorus also 0.4. Silicon 0.2 to 0.35.

Dow Metal Nomenclature Changed

A REVISED nomenclature for Dow Chemical Co.'s magnesium alloys went into effect recently. These changes are as follows:

1. The Dow letter system for alloys already named will be continued, i.e., Dowmetal H will remain as is, etc. However, the dash between the letter and the number "1," designating high purity, is eliminated and J-1 becomes J1, etc.

2. New alloys will be designated by the new A.S.T.M. system. For example, ZK60 becomes ZK60A (formerly this was the designation for aged ZK60).

3. The A.S.T.M. temper system will be used to designate the condition of all alloys. Temper designation is separated from alloy designation by a dash. The table below shows old and new temper designations and their meanings.

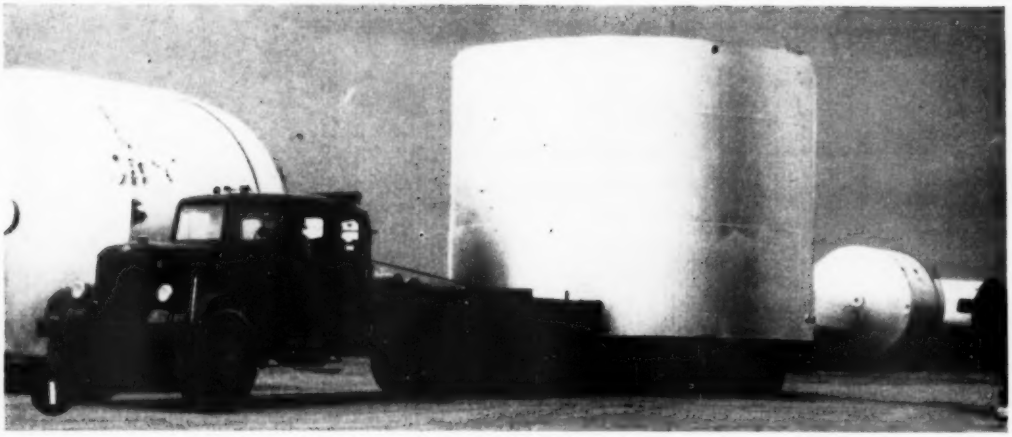
TEMPER DESIGNATIONS

Old	New	Meaning
AC and r	F	As cast, as rolled or as extruded. Used when alloy is applied in conditions other than as fabricated, e.g., 01-F and ZK60A-F
S	T2	Stabilized or annealed (cast products)
HT	T4	Solution heat treated
A	T5	Aged
HTA	T6	Solution heat treated and artifically aged
a	0	Annealed (wrought products)
h	H24	Hard rolled (sheet)

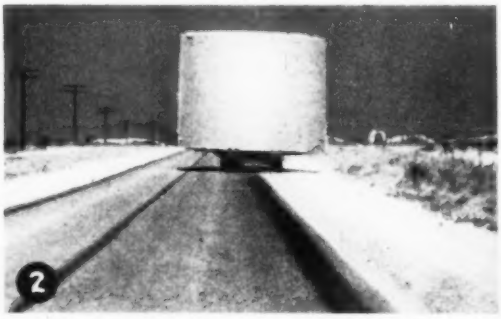
Brazing Terms

Induction Brazing

An electric brazing process wherein heat is obtained from induced current.



1. With tank and skid secured on trailer, forward end of trailer is picked up by winch line and the tank moved out of factory yard.



2. Wide, level highways and sparse population make possible moves like this. In populous areas police escort is required.

3. Cone-bottom tank required special grade. Here trailer, skid, and tank are being lowered onto planks placed across grade.

Trucking Large Shop-Erected Tanks

Here's a step-by-step account of the delivery of a 1,000-bbl. cone-bottom tank by truck. The distance traversed was 30 miles, and the move was completed in 3 hours, over the wide, level West Texas roads.

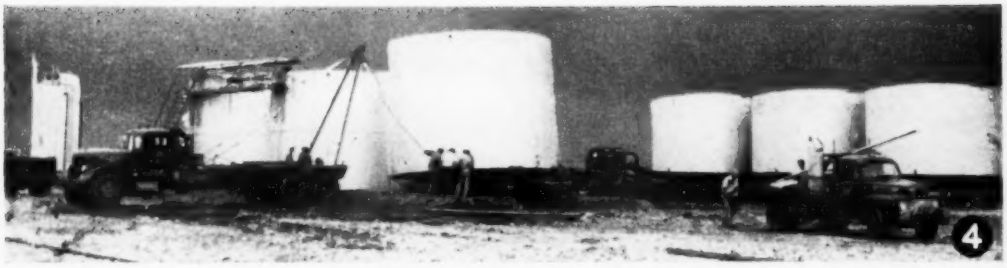
(Photographs by Roy F. Carlson, West Texas District Editor)

THE Permian basin is one of the few areas if not the only one in the United States where large-capacity welded steel tanks are shop assembled, then moved into the field and installed. Accompanying pictures show this operation, made possible because of wide, level roads, sparse population along highways, and nearness of installation points to tank factories.

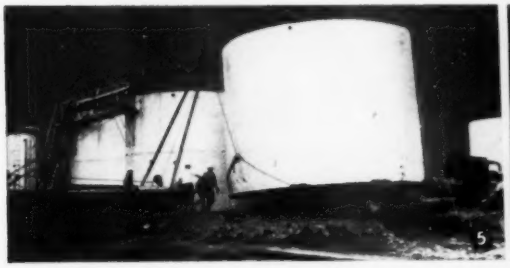
Normal moves of this kind take very little time. When grades of the proposed location of the tank are properly prepared, the tank can be placed in position in half a day. The move shown—a 1,000-bbl. cone-bottom tank—was from the shop of Sivall Tanks, Inc., Odessa, Tex., to Andector field, about 30 miles away. This distance was traveled in about 3 hours, with a large portion of the time being consumed in traversing the outskirts of Odessa.

Because of a special cone-type of bottom, the tank was transported on a special skid, designed to fit the contours of the bottom. Loading of the tank on this skid is done at the tank shop, but from then on, the operation is handled by trucks and truck winches.

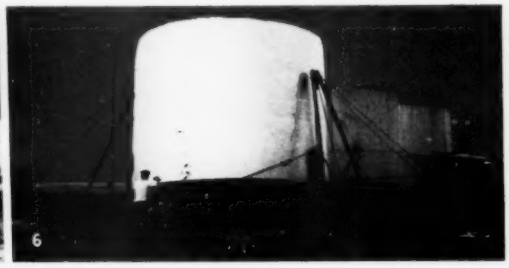
After the tank is securely fastened to the special skid by chains, it is hoisted with the skid onto the bed of the truck and is hauled and placed into position on a "low boy" trailer. This trailer is also specially constructed so that its bed is only a foot



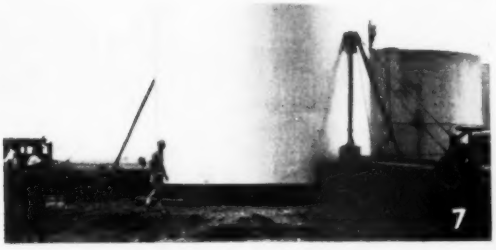
4. Three winch trucks are used in placing tank. Two trucks lift tank while a third removes trailer and skid.



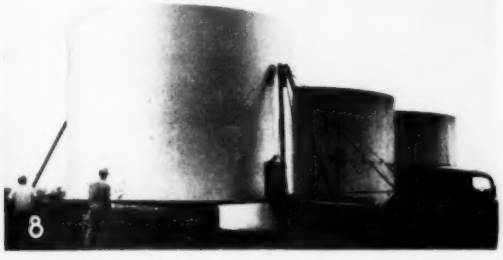
5. Special loops are welded to tank bottom for lifting by one truck. Other side is lifted with line around manhole.



6. In the next step, trailer is removed first and then tank and skid are set down, so that skid fastenings may be removed.



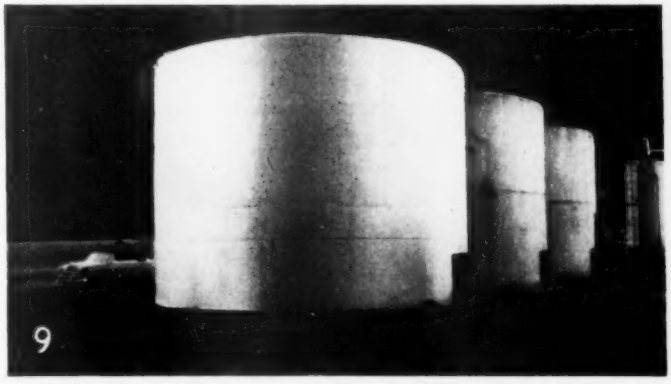
7. Care is used so that tank is properly aligned with others in battery.



8. After proper alignment is achieved tank is lifted and skid removed.

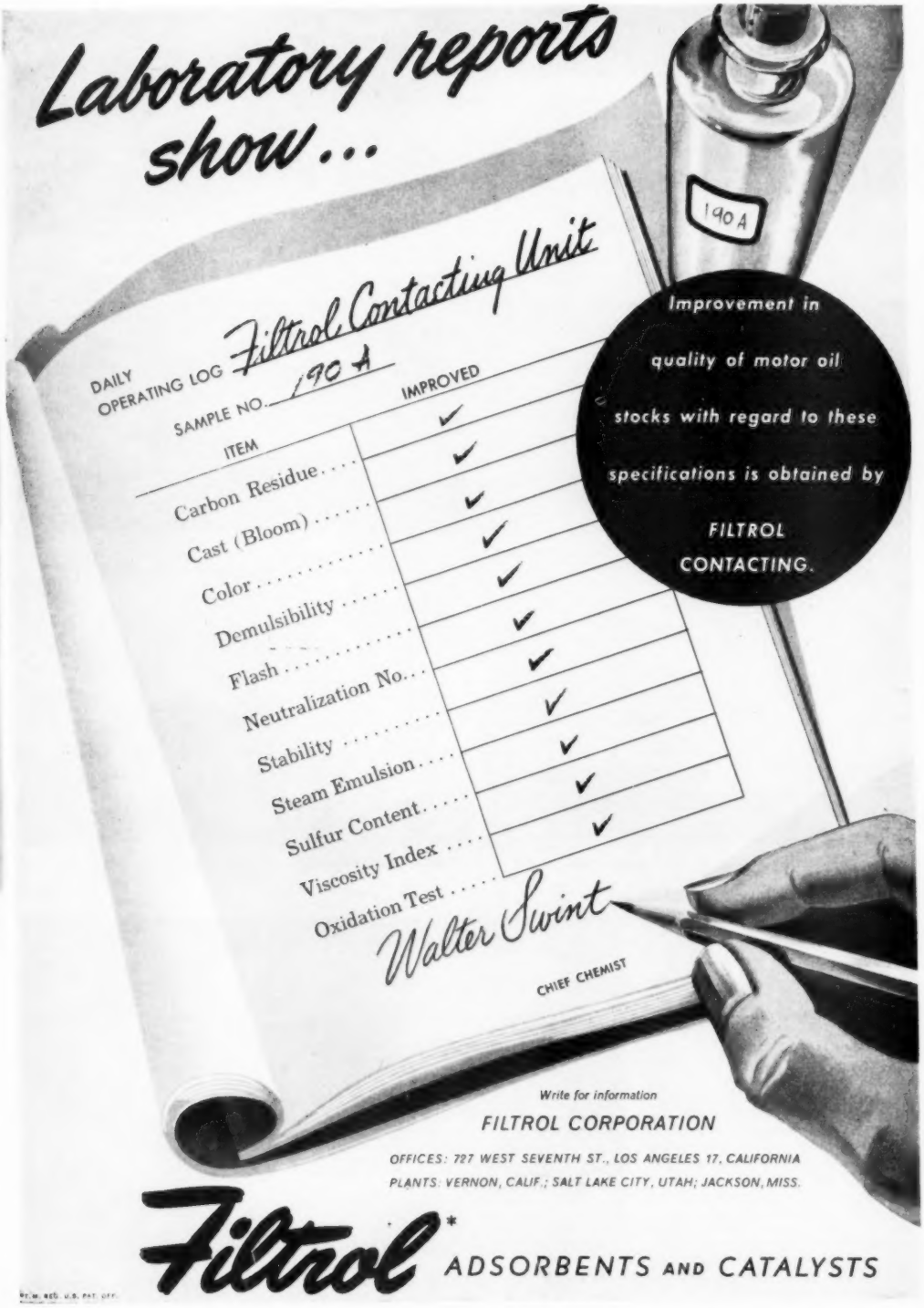
or so off the ground. This is necessary since the high tanks would extend too far into the air if carried on a regular bed or float. Even with the very low trailer, difficulties are encountered with power and telephone lines, these being held high enough for passage of the truck and tank by a long pole.

Once at a location, where a specially prepared grade or foundation has been made, the trailer, skid, and tank are backed into position over the foundation. Then winch trucks hoist the skid and tank off the trailer and the trailer is removed. Then the tank is lifted off the skid, which is then removed and the tank set into place on the grade. All that remains to be done is to finally line up the tanks with any others that may be in the battery, connect filling, draining, and vent lines, and erect access walkways or ladders.



9. Except for very slight alignment, made by jacks when required, the tank is ready for connecting into battery.

Laboratory reports show...



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Cleanout Openings for Oil-Storage Tanks

by I. E. Boberg* and L. P. Zick†

PART 1—DEVELOPMENT OF BOLTED CLEANOUT

THE demand for large cleanout openings of the bolted type was a natural result of the trend toward welded construction. In the riveted tank, an entire shell plate could be removed without hot work, but in the welded tank this could not be accomplished.

The first development was the riveted door sheet as shown in Fig. 1. Essentially, this consisted of a section of shell riveted in a manner that maintained the 85 per cent joint efficiency for which the welded tank was designed.

Functionally, the riveted door sheet served very well, but practical difficulties soon developed. Chief among these was the fact that when riveted construction practically disappeared, skilled riveters and caulkers likewise disappeared.

The first bolted cleanouts were little more than elongaged manholes with equal shell reinforcement above and below the opening. The conception that all reinforcements must be in the shell, raised the opening too far above the bottom for effective use as a cleanout. As a result, a demand appeared for bolted openings of large size, flush with the bottom of the tank.

*Chief engineer and †research engineer, Chicago Bridge & Iron Co.

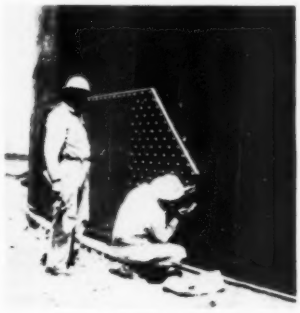

Fig. 1—Riveted door sheet.

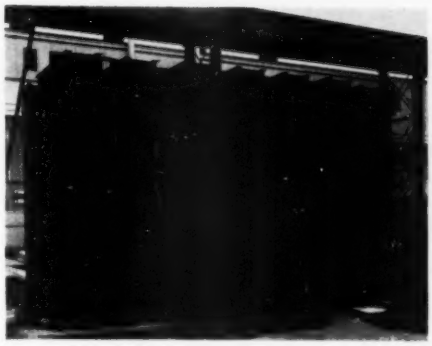

Fig. 2—Full-scale cleanout door in testing device.

From the beginning there were questions as to the safety of any such opening. The effect of bottom restraint, the resultant bending in the shell, the uncertainty of load distribution around such an opening, the notch effect at the corners, and other similar factors all led one to question the use of such construction.

Although a considerable number of small openings were furnished for flushing gasoline tanks, the larger sizes required for the removal of b.s. from crude-oil tanks were not developed. However, due to the great demand for such openings it became necessary to prove or disprove the safety of this construction. As a result, an experimental program was begun with all testing done on full-scale models and facilities included for applying an overload.

This presented something of a problem, but the testing device shown in Fig. 2 was evolved. It consisted of two vertical segments of tank shell, concave to each other, with heavy struts between them to take the unbalanced loads. The bottom and top were supported on closely spaced beams connected by vertical tie rods at their ends. In effect, the testing device was equivalent to an A.P.I. tank 100 ft. in diameter by 40 ft. with facilities for applying an overload equivalent to 80 ft. of water.

As a preliminary step a 1:12 scale model (Fig. 3) was sprayed with stress-coat and tested in a tension machine. The general picture of the stress pattern so obtained was valuable in the proper placing of strain gages on the full-sized test assemblies.

Full-size doors of several types and shapes were tested by insertion into the test shell. In general these doors were 4 ft. high and 6 ft. wide. Strain-gage readings were taken to determine the stress pattern and intensity. Gages were placed inside as well as outside.

Fig. 3—Stress-coat test of scale model.

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Gas Drive in a Nonuniform Bed

IN the preceding unit of this series an expression for the decline of oil-production rate with time for a gas drive was developed. This relationship was made for a uniform bed. It is of interest to inquire into the nature of the decline in a natural situation where the reservoir is not uniform, at least with respect to permeability.

Let it be assumed that a number of beds of different permeabilities lie in parallel but are not communicative. Each will perform then under gas drive as a separate unit and the equation for oil production rate versus time would be for each bed:

$$1/Q - 1/Q_o = b\beta t \qquad (1)$$

where

Q_o = the production rate at time zero.

Such an equation would apply to each bed. If it be assumed that each bed contains the same oil at the same pressure (i.e., constant β) and has the same relative permeability properties as any other bed, then the right-hand side of the separate equations are equal and the equations can be added to give the total reciprocal rate decline versus time. Thus:

$$\sum_{o}^{n} 1/Q_i - \sum_{o}^{n} 1/Q_{io} = n\beta bt \qquad (2)$$

where

n = the number of individual beds being considered and the subscript i represents any individual bed.

Since $\sum_{o}^{n} 1/Q_{io}$ is a constant, the value of $\sum_{o}^{n} 1/Q_i$ must vary linearly with time. This does not mean, however, that the reciprocal of the total production from all beds will be a linear plot with time because $1/Q_{total}$ is not necessarily equal to $\sum_{o}^{n} 1/Q_i$.

The total rate of production is equal to the sum of the individual production rates so that the total flow can be found at any time by finding the individual rates graphically from the reciprocal values. Fig. 1 represents the relationship of reciprocal rate versus time for individual beds. If unequal relative permeability properties or different oils had been assumed the lines could not be parallel. Addition of the individual rates could still be performed after the reciprocal rates are picked off graphically at the same time point.

The production rates at any new time depend upon the rates at zero time, and these zero rates must be known before the method outlined can be used. At a first approximation, the total rate at time zero could be distributed among the several beds in proportion to the permeabilities of the beds. This would be equivalent to assuming that all beds had the same starting oil saturation and were subject to the same pressure gradient.

The cumulative at any time can also be found for each bed and the individual cumulatives added to give total according to the equations:

$$\log Q_i = \log Q_{io} - b\beta C_i$$

and

$$C_{total} = 1/b\beta \sum_{o}^{n} \log Q_{io} - 1/b\beta \sum_{o}^{n} \log Q_i \qquad (3)$$

The individual cumulatives can be picked from a plot similar to Fig. 2.

A knowledge of the individual cumulative amounts produced from each bed can be used to find the gas-oil ratio for each bed according to:

$$\log (R - r)_i = \log (R - r)_{io} + b\beta C_i \qquad (4)$$

A total or average gas-oil ratio cannot be arrived at merely by adding the individual ratios. Each ratio, R_i, is equal to the rate of gas flow in that bed divided by the rate of oil flow in the bed. By using the rate of oil flow previously determined along with this ratio value, the rate of gas flow through each bed can be found.

Once the individual ratios are known, the relationship

$$R_i = R_{io} + b\beta V_i \qquad (5)$$

allows the calculation of the cumulative gas volume through each bed and hence the total gas volume.

Thus, this approach permits one to determine the effect of heterogeneity of permeability on a gas drive. One can find the relatime amounts of gas going into separate layers and the relative reduction in oil saturation for each layer as well as the rate of oil decline for the composite layers. A starting point must be known as is indicated in Fig. 1. In the equations cited, the values of C_i and V_i are assumed to be zero at time zero so that all calculations are related to the beginning time.

(Nomenclature same as in Installment No. 453.)

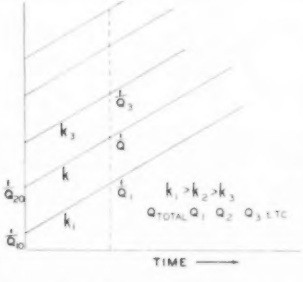


Fig. 1—Method of finding oil-production rates that apply in separate beds at the same time.

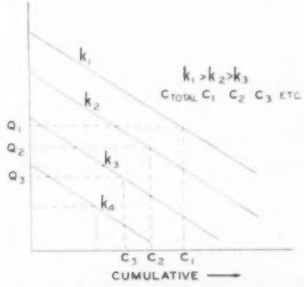
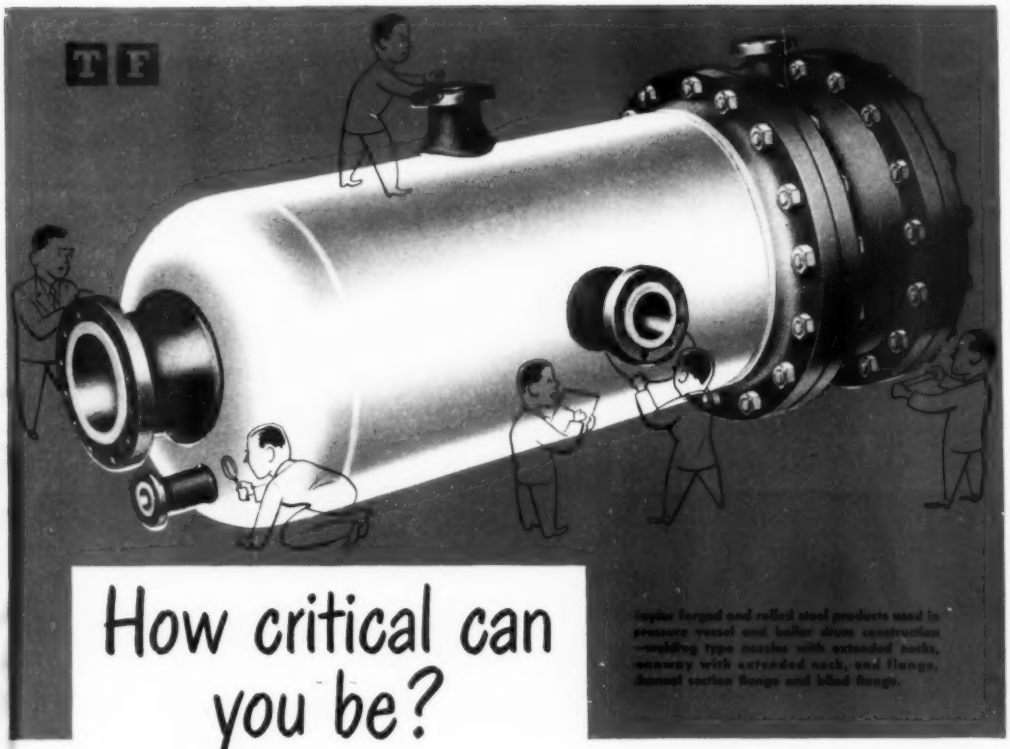


Fig. 2—Method for finding cumulative amounts that apply in separate beds at same time. (Values of Q as found in Fig. 1).

Series by Dr. John C. Calhoun, Jr., Chairman, Petroleum Engineering School, Penn State College



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2 CATALYTIC FUME COMBUSTION. Bulletin B describes the principles of operation and application of this process to the oil refinery and processing industry. *Catalytic Combustion Corp.*

3 DUOTROL BULLETIN 1510 illustrates how the combined pressure and float units of the Autocon Duotrol operate in horizontal pump or in deep-well installations. It explains how more water can be obtained from a pressure tank while greater pressure stability is permanently maintained. Useful tables and specification data are included. *Automatic Control Co.*

4 THREE-STAGE WATER SEPARATOR FILTER. A four-page brochure explains how this filter, used in tank-farm installations, truck-loading racks, aircraft fueling trucks, and drum-filling plants, removes water and dirt from L.P.G., gasoline, diesel, and jet fuels. *Warner Lewis Co.*

5 LITTLE GIANTS OF POWER is an informative booklet describing spark plugs with the patented Coralox insulator, resulting in greater heat conductivity, and electrical resistance at high temperatures. *AC. Spark Plug Division, General Motors Corp.*

6 FLOTATION SEPARATORS used for the removal of oils, greases, and waxes from waste water or water to be reused is described and illustrated in bulletin form. *Sveen Pedersen Sales Corp.*

7 AUTO-LITE THERMOMETER BULLETIN describes and illustrates dial-type temperature indicating and recording thermometers. It also stresses wide range of standard types and flexibility of application. *The Electric Auto-Lite Co.*

8 PRECISION TOOLS FOR PRODUCTION is a 12-page bulletin stressing the importance of heat-processing machines as automatically controlled precision tools in production lines. Descriptions and illustrations include metal brazing, selective hardening, heating-for-forging, tinplate fusion, melting, and normalizing. *Selas Corp. of America.*

9 PRODUCTS AND PROCESSES FOR INDUSTRY. Bulletin 50-I illustrates and describes equipment designed and manufactured for the process industries. It presents case histories of typical process applications together with brief descriptions of the equipment. *Infilco, Inc.*

10 HEAVY-DUTY AIR-COOLED ENGINES, supplied in single-cylinder engines from 3 to 9 hp., and 2 and 4-cylinder engines from 7 to 30 hp., are described and illustrated in a six-page multicolored pamphlet

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which also includes power curve and dimensional data. *Wisconsin Motor Corp.*

11 PACKINGS AND GASKETS. An attractive 32-page catalog illustrates and describes 95 popular packings and gaskets. It also furnishes complete description of construction, service recommendations, and size information on each item. *Raybestos-Manhattan, Inc.*

12 TIRE CONSERVATION. An eight-page booklet explains nine methods used to provide maximum tire service. A truck-tire load and inflation table and a dual-spacing table are among the features included. *B. F. Goodrich Co.*

13 DIESEL CRAWLER TRACTORS. A catalog, in color presentation, contains detailed specifications and information on how the TD-9 diesel crawler tractor develops and applies its 40.5 drawbar horsepower. Several varied job-application scenes are shown along with information on construction and operating features. *International Harvester Co.*

14 DISPLACEMENT TYPE LIQUID-LEVEL TRANSMITTER suitable for connection to any pneumatic receiver-indicator, recorder, or controller to provide closer liquid-level control than obtainable by conventional ball-float-buoyancy type controllers, is fully described and illustrated in Specification Sheet 417-1. Data such as ranges, materials, connections, and dimensions are included. *Minneapolis-Honeywell Regulator Co.*

15 AUTOMATIC CONTROLS FOR DOMESTIC AND INDUSTRIAL APPLICATIONS. A 64-page catalog in three general sections contains information on controls for domestic heating, various industrial applications and magnetic and motorized valves. Illustrations and price lists are also included. *The Mercoid Corp.*

16 STAINLESS STEEL PIPE. Light weight Schedule 5 stainless pipe is described in a set of data sheets. Advantages of light walls that conserve critical alloys and reduce installation costs are outlined, and technical data on wall thickness and pressures are given. *Carpenter Steel Co., Alloy Tube Division.*

17 STUDIES IN CENTRALIZED LUBRICATION is an eight-page multicolored booklet which lists and illustrates four keys to increased production and lower operating expense. *Farval Corp.*

18 MAGNETIC DRIVE AND REGU-TRON CONTROL. Publication 1107 contains complete information on both the magnetic drive and the new magnetic amplifier regutron speed control. Technical information is clarified by charts, diagrams, and illustrations. *Electric Machinery Manufacturing Co.*

19 GROUND RESISTANCE TESTING WITH VIBROGROUND is a seven-page bulletin on geophysical prospecting instruments and soil-resistivity meter. *Associated Research, Inc.*

20 PIPE-LINE PROTECTION FROM CORROSION. An informative, illustrated book describes the hand application, traveling machine, and stationary machine methods when using NO-OX-ID and NO-OX-IDized wrappers. Coverage tables on each are also included. *Dearborn Chemical Co.*

21 BLOCK CATALOG FOR THE TRUCKING INDUSTRY illustrates utility snatch blocks, toggle blocks, wrecker blocks, handiwinches, Crosby clips, and wire rope sheaves. Pictures and ordering information are included. *American Hoist & Derrick Co.*

22 POWER-TWIN HYDRAULIC PULLER. An eight-page bulletin describes how the Power-Twin with its "Center Hole" feature adapts itself to OTC pulling systems. It illustrates time-saving methods for installing and removing cylinder sleeves, shafts, gears, and wheels, and also shows conversion sets. *Owatonna Tool Co.*

23 ELECTRICITY AS REQUIRED. A 16-page booklet illustrates the wide usage of Caterpillar diesel-electric sets on various power applications. It briefly outlines specifications of models ranging from 21 kw. to 314 kw. A special chart for self-regulated and externally regulated sets is also featured. *Caterpillar Tractor Co.*

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THE OIL AND GAS JOURNAL
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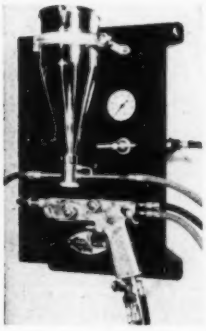
OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

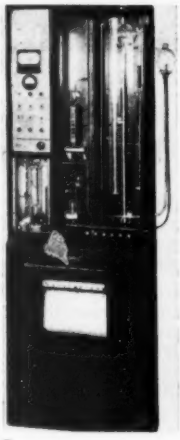
by Dan B. Miller

24 SPRAYWELDER MODEL B. The spraywelder is a power metallizing unit used to execute the Colmonoy Sprayweld process, which consists of applying uniform overlays of Colmonoy hard-facing alloys using metallizing procedures, and then subsequently bonding the overlay to the base metal. The Model B incorporates many new features: lighter weight, eye-level air gage, new greater-capacity air filter, air regulator at convenient height, more positive air and power control valves, finger-tip control with lock for continuous or intermittent spraying, increased cooling chamber, and locked feed mechanism on carburetor. *Wall Colmonoy Corp.*

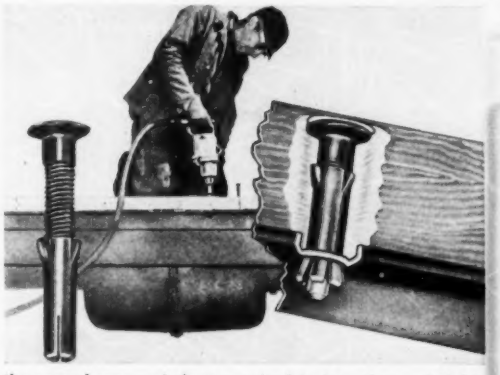


IT'S NEW CHECK IT

25 SIMPLIFIED METHOD OF ADSORPTION FRACTIONATION. Incorporated in one self-contained piece of laboratory apparatus, the method provides a rapid and accurate analysis of light hydrocarbon gases through and including pentanes. Gases are separated, identified, and measured by volume of separated fractions. Separation is by physical adsorption. Identification is made by measurement of the thermal conductivities and the volume of each fraction is arrived at by determining the change in pressure of an evacuated system. Accuracies of the order of 0.2 per cent are obtained. Identifications and measurements of the gas fractions are recorded on a potentiometer, so that a complete and automatic record of each analysis is available to the operator. *Burrell Corp.*



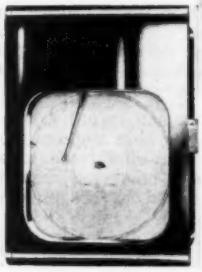
26 SELF-LOCKING SLEEVE BOLT FASTENER. Created to reduce labor costs, this fastener eliminates



the second man or helper required in inserting and tightening up conventional bolt and nut. As it has no nut, it requires no one to hold it. Bolt is simply inserted in hole. A pneumatic tool drives bolt through sleeve and expands six prongs at bottom of sleeve. This forms an extremely tight grip which cannot loosen due to vibration. Bolt head automatically countersinks itself below wood surface. Fastener is made in sizes from ¼ to 1-in. diameter; lengths from 1 in. up, and with hex, square, round, flat, or slotted heads. *Square Tool & Die Co.*

IT'S NEW CHECK IT

27 NEW LINE OF RUNNING-TIME RECORDERS record on a chart the operating or "on" time of production machinery and other similar equipment. The chart record gives the total "on" time in hours, minutes, and seconds for a given period. "Time off" periods are also shown on the chart as well as the time at which they occurred. The Running-Time recorder magnifies the running-



The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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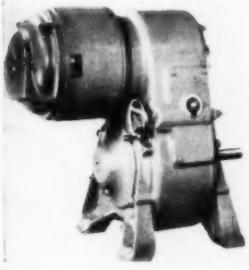
time readings in such a way that the total operating time of a machine can be easily and accurately determined to within a few seconds. Furnished in models suitable for wall, flush-panel, or portable use. *The Bristol Co.*

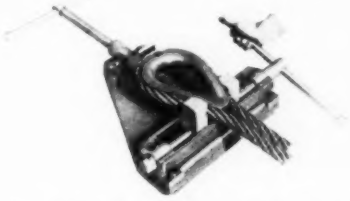
IT'S NEW CHECK IT

28 LARGER HORSEPOWER SPEED-TROL ELECTRIC POWER DRIVES are designed to meet the demand for variable speed drives of 20 and 25 hp. ratings. The unit illustrated is a drip-proof model which prevents liquids or any foreign material from falling into the motor. Motor housing and variable speed transmission case are made of rugged gray iron castings which provide utmost protection against corrosion from moisture-laden or chemical atmospheres. Outstanding features are positive adjustment of pulleys, infinite speed variation, and accurate control of speed under varying loads. *Sterling Electric Motors, Inc.*



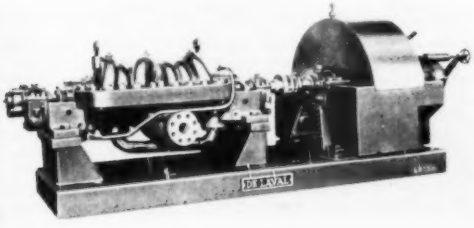
IT'S NEW CHECK IT

29 McDERMOTT RIGGERS' FORMING VISE holds wire rope and cable easier in the desired position and saves considerable time in forming wire rope and cable around thimbles or fixtures for making slings for either splicing or U-clamp and clip installations. This vise handles wire rope and cable from $\frac{3}{8}$ to $1\frac{1}{2}$-in. without use of adapters. *Big Four Machine & Supply Co.*



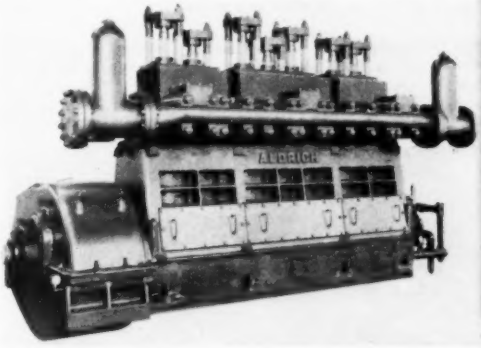
IT'S NEW CHECK IT

30 FOUR-SIX-EIGHT-STAGE OPPELLER PUMPS. The new line of multistage opposed impeller pumps is designed for general medium-pressure and temperature service up to approximately 1,000 g.p.m. and 1,200 psi. for temperatures of 350° to 400° F. They are especially well suited to boiler-feed service, oil-refinery services for handling liquids ranging from propane to strong caustic, and general water services such as descaling. Oppeller pump has a horizontally split casing with suction and discharge nozzles on opposite sides of the lower half of the casing. Impellers are mounted back to back to balance axial thrust and the volutes are staggered 180° to balance radial thrust. Bolted in stuffing box provides a means of applying a plain box with lantern ring for suction lifts; a water-cooled box for high temperatures and high suction pressures; and conventional or special, single, or double mechanical seals or a breakdown bushing and leakoff arrangement. *De Laval Steam Turbine Co.*



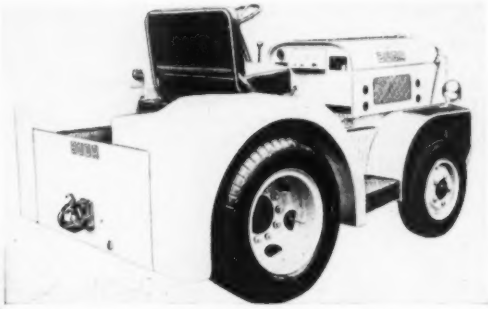
IT'S NEW CHECK IT

31 SIX-INCH STROKE DIRECT-FLOW PUMP. This series includes triplex, quintuplex, septuplex, and nonuplex units, having three, five, seven, and nine plungers, respectively. Ranging from 300 to 900 hp., the 6-in. stroke series covers numerous applications, such as chemical handling, water injection in oil fields, and lean-oil pumping. These direct-flow pumps operate at crankshaft speeds up to 300 r.p.m. and are suitable for direct drive by engine or synchronous engine-type motor. The pumps feature inverted design and a direct-flow fluid-end. All wearing parts are interchangeable among three, five, seven, and nine-plunger units. The fluid end is sectionalized in construction so that maintenance is simplified and inexpensive. Reduced space between valves affords higher volumetric efficiency; and changes in plunger size can be readily made to meet alterations in pressure or capacity. *The Aldrich Pump Co.*



IT'S NEW CHECK IT

32 DIESEL OR GASOLINE-POWERED TRACTOR WITH TORQUE CONVERTER. A new 12,000-lb.-drawbar-pull tractor with torque converter is designed to handle all industrial tough pushing and pulling jobs. The HA-120 Shop Mule tractor with a single-stage, closed-circuit-type torque converter eliminates shock and undue strain and smoothly applies maximum power even when starting under full-load conditions. It is powered with a 6-cylinder, 230-cu.-in.-displacement Buda model



6-B-230 gasoline engine. As optional equipment this tractor is available with a Buda model 6-BD-230 diesel engine of the same large displacement and interchangeable mounting dimensions. Other features include safe four-wheel hydraulic brakes, positive heavy-duty transmission with four forward and one reverse speed, 17-gal. Protectoseal fuel tank, adjustable seat, and dual pneumatic drive tires. *The Buda Co.*

IT'S NEW CHECK IT

33 DICA-RODE, a new asphaltic coating, is manufactured in two forms, one form incorporating long-fibered Canadian asbestos to give the coating greater tensile strength and greater body, the other without asbestos fiber. Premium asphalts are used in both forms.

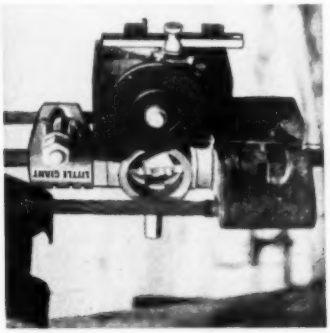
The coating without asbestos fiber is suitable for use on underground portions of concrete or steel foundations. Fibered Dica-Rode is preferable for use on pipe lines. One gallon will insulate about 100 sq. ft. of new pipe surface or 50 sq. ft. of old pipe. Easily applied "cold" by brush or spray, Dica-Rode shields pipe from earth acids and salts and "stray" electric currents. The material is practically unaffected by such common corrosion causes as nitric, sulfuric, and muriatic acids. *The Zone Co.*

IT'S NEW CHECK IT

34 NEW MULTIPLE-PUMP UNIT combines the performance of the rotary positive displacement pump with new and improved features insuring foolproof alignment and durability. Unit is designed for use wherever different liquids are to be pumped with a single compact unit. It is especially suitable where floor space is limited. Customers are offered a choice of bronze bearings having oversize oil reservoir or self-aligning ball bearings. Other features insuring perfect and lasting alignment include outboard integral ball bearings on each pump, heavy reinforced-steel base plate, and flexible coupling. Each pump is controlled by individual oversize manually operated clutches. Units will pump anything that will flow through a pipe line; light or heavy oil, gasoline, or asphalts. Units are available with capacities from 90 to 300 g.p.m. in pipe sizes 2, 2½, and 3-in. *Granberg Corp.*

IT'S NEW CHECK IT

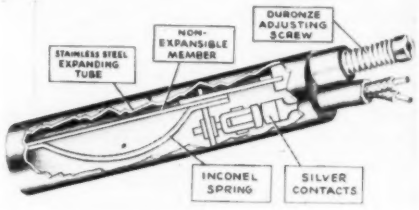
35 J-F DYNAMOMETER is a simple-to-operate instrument used for operational control of pumping wells. By calculating the deflection of a steel proving ring, it measures and records the pumping load at every point



in the stroke and measures counterbalance effect at the polished rod. It tells when the traveling valve in the pump opens on the down stroke and gives an indication of the working fluid valve, the weight of the fluid, and the stability of the pumping operation. It records unnecessary loads and measures horsepower being transmitted to the sucker-rod string at the polished rod. *Johnson-Fagg Engineering Co.*

IT'S NEW CHECK IT

36 SCAICO EXPANDING TUBE THERMOSTAT utilizes a stainless-steel tube as the expanding member and an Invar strip as the nonexpanding member. An Inconel spring gives fast make and break action. A Duronze adjusting screw permits quick and easy setting of the control point at any temperature up to 600° F. Pulling or flexing of the leads cannot effect contact position and



leads may be conveniently replaced if necessary. Leads of any desired length are supplied. Massive silver contacts provide two breaks in series, for long, maintenance-free life. Thermostats are made in three types for conduction, convection, or immersion. Series 12 is ½ in. in diameter, 2-3/32 in. long for 600-watt loads at 110 volts, or 230 volts, a.c. or d.c. Sensitivity is 0.2° F. on 1-amp. load. Series 58 is ⅝-in. in diameter, 3 in. long for 1,000-watt loads at 110 or 230 volts a.c. or d.c. Sensitivity is 1° F. on 1-amp. load. *Smith Control & Instrument Corp.*

NATURAL GAS

South Bend Kick-Off

Construction begins on big gas-storage project

PITTSBURGH. — Work was started last week on a 12,000-hp. compressor station as initial-construction phase of a major underground natural-gas-storage program in Indiana and Armstrong counties. Known as the South Bend project, it will be built and operated by New York State Natural Gas Corp. and East Ohio Gas Co., subsidiaries of Consolidated Natural Gas Co. *(The Oil and Gas Journal, June 14, page 119).*

The program, estimated to cost $8,969,100, will be financed by sale of New York State Natural securities to its parent firm, Consolidated Natural.

On completion, up to 13 billion cubic feet may be stored and the maximum deliverability will be 264,000 M.c.f. a day.

Storage schedule.—By October 1951, operators expected to have stored in the pool 8.2 billion cubic feet of gas; however, both East Ohio Natural and Peoples Natural Gas Co., another Consolidated affiliate, plan to withdraw about 4.2 billion cubic feet during high-demand periods of the winter of 1952-53. A billion cubic feet will be stored during the same period so that storage inventory for March 1952 will be 5 billion cubic feet. Goal for October 1952 is expected to be 13 billion cubic feet.

New York Natural will acquire the storage site from Peoples. Reconditioning of old wells has been under way, and development contemplates working over 51 active wells and redrilling 28 abandoned wells.

Construction has also started on a 77-mile, 20-in. line from the South Bend storage area to the Petersburg measuring station on the Ohio-Pennsylvania state line in Lawrence County, northwest of Pittsburgh. Seventeen miles of field-gathering lines are being built.

Kansas Commission to Study Hugoton Selling Pressures

WICHITA. — The Kansas Corporation Commission resumed last week a study of pressures at which Hugoton-field gas is bought and sold.

The commission set no hearing date but issued an order stating that it will "fully explore any variance and differentials in the units of measurement in which gas is being produced, purchased, sold, and resold in Kansas."

The state-approved standard for measuring natural gas for production sale and resale is 1 cu. ft. at 60° F. under 16.4 psia.

The commission said it would determine whether the state standard prevails as the unit of measurement or whether there has been discrimination against any party or the public contrary to the rules and regulations.

Shell Plans Ammonia Plant

DOMINGUEZ, Calif.—Shell Chemical Corp. will build a new synthetic-ammonia plant here using natural gas as raw material for the synthesis reaction. The plant will be incorporated with Shell's other petrochemical-manufacturing units at Dominguez.

Production will be devoted principally to supplying nitrogen fertilizer to farmers in California, Arizona, Oregon, and Washington. The plant also will produce nitrogen for the manufacture of munitions, nitric acid, commercial explosives, paper pulp, and other industrial uses.

Phillips Rehearing Urged

WASHINGTON. — Senator Wiley (R., Wis.) last week urged the Federal Power Commission to rehear the controversial Phillips Petroleum Co. gas case and assume jurisdiction over rates charged by the company.

One of the lines receiving gas from Phillips is Michigan-Wisconsin Pipe Line Co. which in turn supplies gas to the senator's constituents. The latter firm contends it has no control over the high rate it pays Phillips for gas and therefore is itself forced to charge a high rate.

FPC ruled recently that it does not have jurisdiction over gas rates charged by Phillips. The formal decision has not yet been issued.

May Gas Sales Increase

NEW YORK.—Sales of natural gas during May gained 13.9 per cent over those during May 1950 to total 3,452 million therms, according to the monthly report of the American Gas Association.

For the 12 months ending May 31, sales totaled 41,982 million therms, an increase of 19.7 per cent over the same period a year ago.

FPC Amends Shipping Rules

WASHINGTON.—The Federal Power Commission has issued an order amending regulations under the Natural Gas Act to exclude the owner of a source of supply of natural gas proposing to export or import the gas from the necessity of participating in the application to FPC.

Natural Gasoline

Texas Gas Products Buys Benedum Plant Interest

DALLAS. — Upton Gas Product Co.'s interest in the Benedum natural-gasoline plant in Upton County, West Texas, was sold here last week to Texas Gas Products Corp. for a consideration reported to be around $2,000,000.

The plant will continue to be operated by Texas Natural Gasoline Corp., parent firm of Texas Gas Products, which designed and erected the plant in 1949.

The plant processes about 65,000,000 cu. ft. per day of inlet gas from which it extracts about 90 per cent of the propane and substantially all heavier components.

It has a liquid throughput of about 7,740 bbl. of hydrocarbons.

According to reports, major extensions and additions to the plant are to be made soon in order to provide capacity for processing more gas from the Spraberry-trend area.

Moore County, Texas, to Get New Natural-Gasoline Plant

DUMAS, Tex.—Colorado Interstate Gas Co., Colorado Springs, Colo., will build a new compressor station and natural-gasoline-extraction plant near here in Moore County, according to Roy O. Thomas, assistant to the president.

Thomas said the new installations will result from a merger of Canadian River Gas Co., Amarillo, and Colorado Interstate.

In addition to the plants, a new pipe line will be laid to connect the Moore County field with Hugoton, Kans., through a tie-in at the company's Kit Carson, Colo., compressor plant.

Texas L.P.G. Plant O.K.'d

HOUSTON.—A $4,100,000 natural-gasoline plant being built by Ohio Oil Co. and Sun Oil Co. in Matagorda County, Texas, has been approved for rapid tax amortization by the Defense Production Administration.

The plant is expected to have a processing capacity of 100,000 M.c.f. per day of gas received from North Markham and North Bay City fields in the county.

Eighty-five million cubic feet of dry gas per day will be sold to a gas-transmission company.

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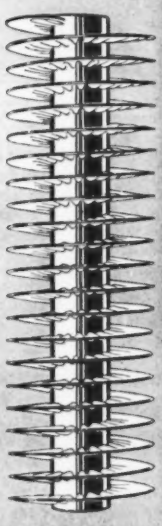

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PIPE LINES

Texas Eastern Awards 160 Miles of Contracts

SHREVEPORT.—Texas Eastern Transmission Corp. has awarded contract for construction of 79½ miles of 30-in. natural-gas line from the Cumberland River in northern Tennessee to a point near Columbia, Ky., to Oman Construction Co., Nashville.

Texas Eastern awarded a second contract to N. A. Saigh Co., San Antonio, for construction of 82 miles of 30-in. gas line from a point near Columbia to the Kentucky River.

Contracts now have been let and construction is under way on 7 of 10 sections of the company's new 791-mile, 30-in. line from Kosciusko, Miss., to Connellsville, Pa.

Work also has started on three of the big line's compressor stations and is scheduled to begin immediately on the other nine.

Also under construction and scheduled for completion in August is a 35-mile pipe line from Connellsville to the Oakford underground-gas-storage reservoir in Pennsylvania.

The big gas line together with the Oakford project constitute the major portion of Texas Eastern's $114,300,000 expansion program which will increase peak-day-delivery capacity to approximately 1.2 billion cubic feet of gas.

Pending completion of the Oakford line, Texas Eastern is delivering gas to the reservoir through another company's facilities, and has shipped an average of approximately 35,000,000 cu. ft. per day. Half of these deliveries are for the account of New York State Natural Gas Corp., Texas Eastern's partner in the storage operation.

Great Lakes Ships Again By Skirting Flood Area

KANSAS CITY, Mo.—Great Lakes Pipe Line Co. last week was again accepting gasoline shipments to all terminals except flood-ravaged Kansas City.

The pipe lines assigned to gasoline service were initially operating at 71 per cent of capacity, but were scheduled this week to be back to 90 per cent of normal capacity.

The pump station here was still idle because of flood damage to equipment, and shipments were being pumped around the city. Temporary pumping equipment, powered by converted Allison aircraft engines, was being installed at Leavenworth, Kans., 25 miles northwest of Kansas City, and at Paradise, Mo., the same distance to the north, thus making possible the increase in capacity of the 12-in. lines to 90 per cent or normal.

Lines from Oklahoma and Kansas refineries spread north and northwest from the city to serve delivery terminals at 13 locations, in Iowa, Illinois, Minnesota, Nebraska, and North and South Dakota.

Harry Moreland, Great Lakes president, estimated that it may require 2 months to repair station and terminal damage at Kansas City.

CONSERVING STEEL.—Tractor with cradle removing natural-gas line from ditch in salvaging operations near Linsdale, Tex.

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Connecticut Court Stalls Northeastern Gas Pipe Line

BRIDGEPORT, Conn.—The denial here by a Superior Court judge of an immediate pipe-line right-of-way through Fairfield County, Connecticut, has delayed indefinitely completion of construction of Northeastern Gas Transmission Co.'s natural-gas line to the Northeast and the introduction of natural gas to Connecticut.

The judge, John T. Cullinan, rejected an argument by Northeastern that an emergency exists in the area due to insufficient supplies of manufactured gas.

The ruling was an initial victory for 79 property owners who are contesting the company's condemnation proceedings and challenging the constitutionality of certain state laws.

As the case now stands, the property owners will have their legal rights determined by the courts before the lands are taken.

Whether Northeastern would appeal to the state's Supreme Court of Errors was not yet decided pending the return from Washington of William C. Norman, company president.

One company official was quoted as saying that if Northeastern did not get immediate right-of-way, it would not be able to install the line until next spring.

O.N.G. Completes New Line To Carry West Edmond Gas

Oklahoma Natural Gas Co., Tulsa, has completed its new natural-gas-transmission line from West Edmond to Depew, Okla. Cost of the line, comprising 53 miles of 26-in. pipe, is estimated at $2,756,000.

The line will take residue gas from gasoline plants in West Edmond field and deliver to the new Depew underground-gas-storage project. Currently, 85 per cent of Oklahoma Natural purchases are in the form of residue gas received from gasoline plants.

California Body Studies 87-Mile, Texas-Line Loop

LOS ANGELES.—The California Utilities Commission is now considering data supplied it by Southern California Gas Co. and Southern Counties Gas Co. in support of an application to install 87 miles of 30-in. natural-gas line in Riverside County, California, paralleling the present line from Texas.

Permission to install the new line would increase capacity of the existing California segment of the Texas line by 150,000,000 cu. ft. per day.

In addition the program would include the installation of two new compressor units at the Blythe, Calif., station.

An application also has been filed with the Federal Power Commission in Washington.

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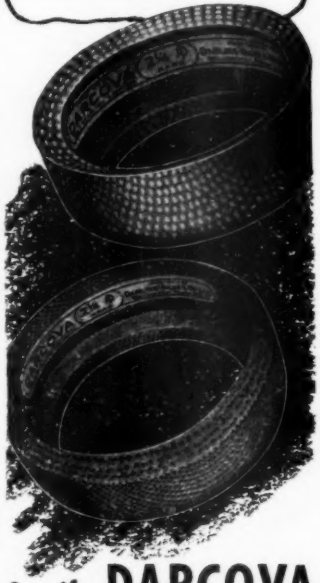

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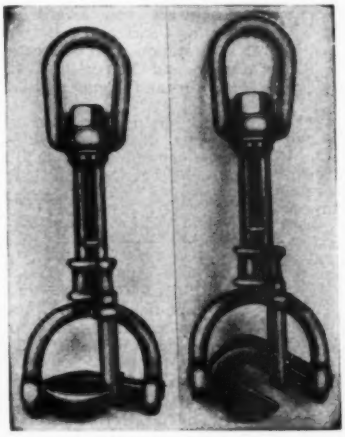

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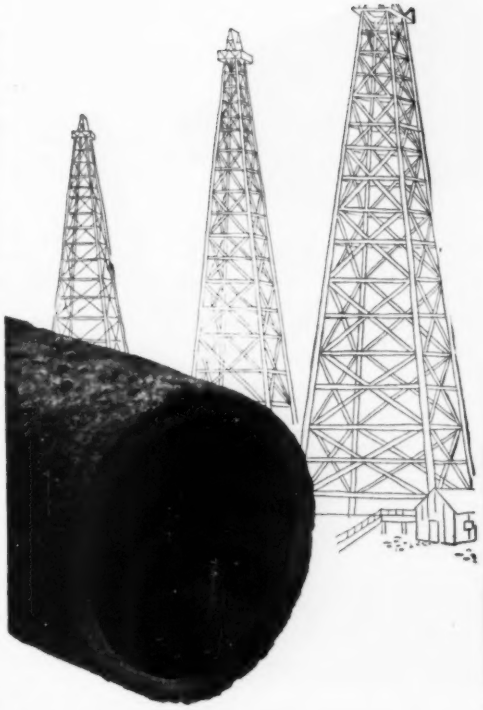

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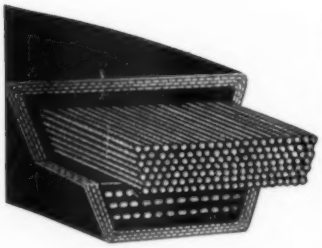

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Spokesmen for the companies said that construction is slated to begin about next February 1, if both agencies approve the project. The installations are estimated to cost about $7,700,000.

Sinclair Lays Line Across Missouri River Channel

Sinclair Pipe Line Co. laid a 550-ft., 4-in. emergency loop last week across a new channel cut during recent floods of the Missouri River at a point about 18 miles from St. Charles, Mo.

This is a temporary line to insure continuous service in case there might be trouble in operating the main parallel line.

The announcement was made by R. J. Tibbets, president, at a dinner in Tulsa July 27, where 37 employes were presented with 35-year service pins. A special award was given to Ernest W. Roe for 47 years' service.

At recent dinners at Independence, Kans., and Fort Worth, Tex., 35-year service pins were presented by Tibbets and R. C. Bearden, vice president, to 15 employes.

Texas-Illinois Compressor Stations Under Construction

HOUSTON.—Work has been started by Hydrocarbon Construction Co. of this city on a subcontract to build four compressor stations on Texas-Illinois Natural Gas Pipeline Co.'s big Gulf Coast-to-Joliet, Ill., natural-gas line.

D. D. Sprow, superintendent of operations for Texas-Illinois, said the subcontract was awarded by Fish Pipeline Construction Corp., Houston.

The stations will be located at New Caney and Marshall, Tex., and at Malvern and Biggers, Ark., Sprow said.

Work on a compressor station at Centralia, Ill., was started by Hydrocarbon several weeks ago. Engineering for the line was handled by Fish.

Pipe Line Briefs

Buckeye Pipe Line Co. is planning to put $24,000,000 into the building of a pipe-line system from Linden, N. J., to consuming areas in eastern Pennsylvania and central New York.

Gulf Refining Co.'s Tulsa pipe-line division held a 4-day conference last week in Tulsa for 60 supervisory personnel including 45 from the field and 15 from the Tulsa office. Technical and operating problems were discussed at 16 sessions. Special emphasis was given to corrosion control during a field-trip demonstration at the company's Perryman pump station.

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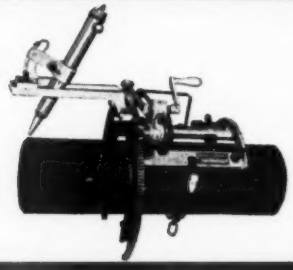

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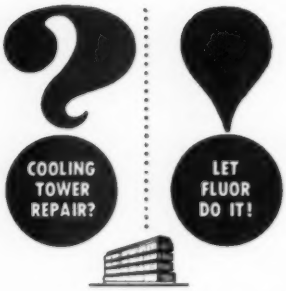

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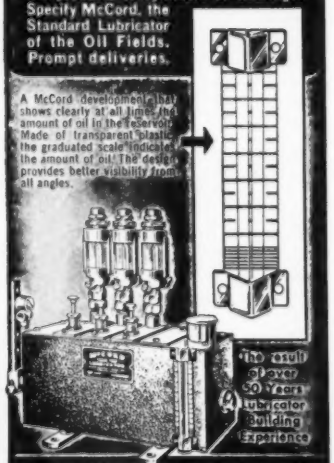
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REFINING

Avgas Units Slated

Eastern States to expand and revamp Houston plant

HOUSTON.—A $3.3 million expansion and revamping program for the 43,000 bbl. per day Eastern States Petroleum Co. refinery here has been announced by the company.

The program involves the installation of a 4,500-bbl. Platforming unit and the rehabilitation and reactivation of a 2,600-bbl. HF alkylation unit. Both of these projects were approved for rapid tax amortization by the Defense Production Administration.

A third project being considered by Eastern States is the expansion of its fluid catalytic cracking unit from its present capacity of 13,000 bbl. to a future capacity of 18,000 bbl.

Avgas improvement.—Purpose of the expansion is to improve the aviation-gas facilities and to increase the availability of high-octane avgas and other defense products. The Platforming unit may be converted from production of 4,500 bbl. of base stock for aviation gasoline to 4,500 bbl. of aromatics per day. When operated under conditions to produce motor-fuel base stock, the output of the Platforming unit is increased to 6,000 bbl.

The revamping of the alkylation unit will include the adaptation of the newest modifications developed for HF units since the close of World War II.

Platformer under way.—Construction of the Platforming unit is now under way, and completion is expected by the first of the year. Negotiations are still being conducted with government officials with respect to the alkylation unit. Once contract terms have been agreed upon, it is expected that revamping the alkylation unit can be completed in 4 months.

Eastern States is experiencing a period of solid growth in the oil industry. It recently opened its first producing area at West Bishop in Nueces County, Texas, where it has three producers and lease rights on 1,100 acres. Other oil and gas exploration is planned for North Texas and along the Gulf Coast of Texas and Louisiana.

The company is also a participant in the Rancho pipe line system to be constructed between West Texas and Houston *(The Oil and Gas Journal, July 19, page 60)*.

The refinery is located on the Houston ship channel a few miles south of the city. Facilities are available for a crude-oil charge of 43,000 bbl. per day, thermal cracking capacity of 16,000 bbl. per day, and catalytic cracking capacity of 13,000 bbl. per day including 700 bbl. of polymer production.

Roosevelt to Begin Work On New Aromatics Units

MOUNT PLEASANT, Mich.—Roosevelt Oil & Refining Corp. will begin construction by August 25 of Platforming, treating, and extraction facilities here for the production of finished, industrial-grade aromatics, benzene and toluene.

The facilities, now being designed by Universal Oil Products Co., will be constructed by Procon, Inc. They

NELSON REFINERY-CONSTRUCTION INDEX

Appears in the first issue of each month.
Explanation—Cost-imating No. 61, December 15, 1949, pages 91, 92.
Compiled by W. L. Nelson—Refinery Consultant—Tulsa.
Indexes of Individual Equipment Items—January, April, July, October.

INDEX (1946 = 100)

	1947	1948	1949	1950	April 1951
Centrifugal pumps	109.0	120.0	118.9	128.1	136.2
Reciprocating pumps	128.5	138.1	144.6	143.9	183.3
Compressor	114.0	128.0	120.0	118.8	138.1
Engines	109.0	120.0	115.5	117.9	137.1
Motors	110.0	112.7	114.0	130.8	148.8
Transformers	116.0	116.0	116.0	116.0	130.5
Instruments	113.0	120.0	122.0	127.8	142.4
Miscellaneous equipment avg.	114.2	122.1	121.6	126.2	145.2
Materials component	122.4	139.3	143.6	149.5	164.4
Labor component	113.5	128.0	137.1	144.0	150.0
Refinery construction index	117.0	132.5	139.7	146.2	155.8

are scheduled for completion in July 1952.

The new Platformer will process a narrow-boiling-range, straightrun-naphtha cut obtained from Michigan crude. The treating unit, using excess hydrogen from the Platformer, will be used as a hydrogenation unit to process an aromatic-distillate stock obtained from thermal cracking units as a byproduct of ethylene manufacture. Aromatics will then be separated by the extraction unit.

In addition to producing aromatics, the Platformer will have sufficient capacity to upgrade Roosevelt's normal gasoline output. Aromatics produced by the new facilities will supplement normal production of company, which will continue to produce naphthas, heating oils, etc.

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T. J. Williams, Roosevelt's refinery superintendent, is project engineer.

Refiners to Hear PAD Air Aviation-Fuel Requirements

ALMA, Mich.—Refiners in this area will hear August 17 what the Petroleum Administration for Defense is going to require in the way of production of jet fuels and military aviation gasoline.

An address on the subject will be delivered here by T. L. Apjohn, assistant director of PAD's refining division, at a meeting sponsored jointly by the Western Petroleum Refiners Association and Leonard Refineries, Inc.

Apjohn will also discuss the proposed specification for JP-4 fuel.

Materials used in the manufacture of gasoline additives will be discussed by Byron B. Morton, International Nickel Co., in his paper on "The Use of Certain Alloys to Resist Corrosion in Petroleum Refineries."

Refining Briefs

Delta Refining Co., a subsidiary of the Missouri Farmers Oil Association, has announced plans to build a catalytic cracking unit and add more than 70,000 bbl. of storage capacity at the company's Memphis refinery. The new cracking plant is expected to be completed in 1952. It will increase refinery capacity from 4,000 to 6,000 bbl. per day.

Union Oil Co.'s refinery at Wilmington, Calif., has been completely rebuilt and is again running after damages from a $2,999,000 fire were repaired. The Wilmington plant has a crude-oil capacity of 69,000 bbl. per day.

Socony-Vacuum Oil Co., Inc., during the first 6 months of 1951, produced and refined more crude oil than in any 6-month period in the company's history, stated President B. Brewster Jennings in a semiannual report on company operations. Net domestic production, averaging 210,000 bbl. daily, was up 27 per cent from the first half of 1950. Refinery runs in this country averaged 520,000 bbl. per day, up 14 per cent from the 458,000 bbl. per day mark of first half of 1950.

Carter Oil Co., Tulsa, has announced that there is a possibility that the company may build a refinery at Salt Lake City, depending on results obtained from a new $5,000,000 allotment for oil exploration in eastern Utah's Uintah basin this year. John R. Suman, vice president of Standard Oil Co. (N. J.), Carter's parent firm, indicated Carter may refine basin crude at Salt Lake and ship products to the West Coast through a contemplated new pipe line.

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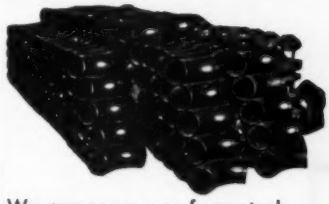

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407

Among the Drilling Contractors

New Contracting Firm To Operate at Casper

David True, manager of Reserve Drilling Co., Casper, Wyo., for the past 3 years, and Douglas Brown, also of Casper, have formed a new partnership to engage in contract drilling. They will operate as True & Brown. They also have acquired all outstanding shares and undivided assets of Reserve Drilling Co. and will continue to operate that company along with their partnership. The partnership is starting with three rotary rigs obtained from the Reserve transaction.

Glenn Gillespie & Sons, Cushing, Okla., will drill a Wilcox sand test in the abandoned Marathan pool, Noble County, Oklahoma. Operator is Midco Oil Corp. The test is 1 Dale, SE SW SE 13-22n-2e.

George Acuff Drilling Co., Casper, Wyo., has a new wildcat job under way for Stanolind Oil & Gas Co. at 1 Case, SW SW 9-4n-82w, south of Billy Creek, Johnson County, Wyoming.

Denman Drilling Co., Farmington, N. M., has a contract with J. D. Hancock for a 6,500-ft. exploratory test to be drilled 25 miles west of Cuba, in Sandoval County, in the San Juan basin, northwestern New Mexico. Location is in the C SW 33-21n-5w.

Olson Drilling Co., Tulsa, is making hole on a wildcat test northeast of Frederick, in Tillman County, southwestern Oklahoma. The test, being drilled for Carter Oil Co., is 1 Kurz, located in the SE SW SW 25-1s-17w. Hole is projected to the Arbuckle lime or a depth of approximately 5,775 ft. This contractor also has started work on a well for Superior Oil Co. in the Southwest Antioch pool in Garvin County.

New Contractor Drilling

The newly organized Meridian Drilling Co. is the contractor on a wildcat test which Atlantic Refining Co. is starting in the area 4½ miles west of Port, in Beckham County, western Oklahoma. The new company, which has headquarters at Oklahoma City, is headed by J. Walter Leonard, president; C. E. Crosby, vice president and treasurer; and Reid Brazell, secretary. Atlantic's test is 1 Parker. Location is in the NE NW SW 14-8n-21w.

ACTIVE ROTARY RIGS*

(United States and Western Canada)

Area—	Week ended 7-23-51	Change week ended 7-16-51	Change week ended 7-24-50
Gulf Coast	604	+30	+86
W. Tex.-N. M.	929	+16	+174
Adk.-N. La.-E. Tex.	164	+6	+9
Oklahoma	290	—23	+30
Kansas-S. Nebraska	159	—17	+28
Illinois-Eastern	166	+2	+6
Rocky Mountains	165	—2	+67
Pacific Coast	153	+8	+13
Total United States	2,630	+20	+413
Western Canada	133	—5	+39
Total	2,763	+15	+452

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States and the Gulf Coast and Arkansas-North Louisiana-East Texas areas are shown on pages 134 and 135.

Donnell Drilling Co. Odessa, Tex.

DONNELL DRILLING CO., operating out of Odessa, Tex., where its main office, shops, and yards are located, is one of the more active and progressive contracting organizations in the West Texas area. Formed in 1945, at which time it had only one rig, the company has expanded its operations until now it is operating seven rotary rigs ranging in depth capacity ratings of from 3,000 to 15,000 ft.

ROBERT DONNELL

Management.—Robert Donnell, whose name the company bears, has directed operations of the company since it was organized. Before organizing the company, he had been with Two States Drilling Co., Dallas, for 2 years, and previous to that he had been associated with Magnolia Petroleum Co. for 15 years.

Key personnel.—E. H. Helm is drilling superintendent; R. E. Dublin, as-

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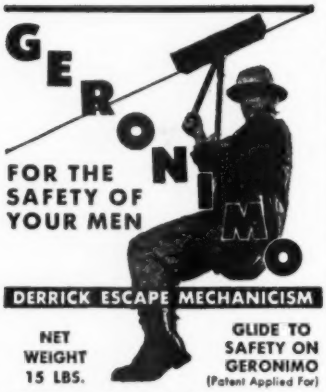

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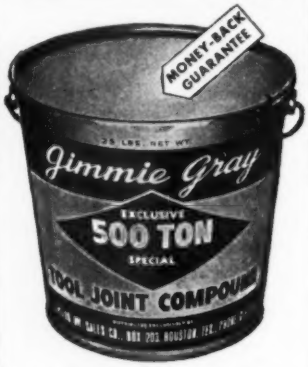

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sistant drilling superintendent; T. L. King, shop and maintenance superintendent; Ray Boling, H. G. Wilhelm, Leon Kelly, C. G. Holderman, Lee Collyar, and B. W. Yocham, tool pushers.

Affiliates.—Donnell Exploration Co., also formed and directed by Robert Donnell, is a cable-tool drilling and well servicing firm in the area. Headquarters are maintained at Artesia, N. M. Carl Byler and Gaylord Watts are in immediate charge of operations.

Rogers-Fain Drilling Co., Oklahoma City, has the contract for a projected Arbuckle lime test (approximately 5,000 ft.) which An-Son Petroleum Corp. is starting north of the Loco field, Stephens County, Oklahoma. Location is for 1 Baker, NW NE NW 29-2s-5w.

Colorado-Wyoming Drilling Co. is drilling on its contract with Wycola Oil & Development Co. at 1 Patented, C SE 4-9n-61w, a Dakota series exploratory test on the Keota prospect in Weld County, Colorado.

Denver Basin Oil Co., Brush, Colo., is the drilling contractor on a Dakota exploratory test which Robert H. Dee, Sr., and William Chapman of Denver are putting down in south central Morgan County, Colorado, at 1 Huey Morland, NW NE NW 12-1n-57w. At latest report hole was below 4,025 ft.

Wofford Drilling Co., Tulsa, will drill a Mississippi chat test (approximately 4,400 ft.) for K. A. Ellison on the latter's Shawver lease in the NW SE NE 13-25n-1w, about 4½ miles southeast of Tonkawa, Kay County, northern Oklahoma.

Melco Drilling Co., Seminole, Okla., has started on a projected 3,150-ft. contract with Chupp & Vaughn for a well in the Maramec area, Pawnee County, Oklahoma. Location is for 1 Adler, C SE SE 4-20n-6e.

Mountain States Drilling Co., Cody, Wyo., is moving a heavy rig to the Frisby area, Big Horn County, Wyoming, where it has the contract for a 12,500-ft. test to be drilled for Husky Oil Co. at 1 Government, C NE NE 29-49n-93w. Hole already has been spudded to 160 ft. with cable tools.

E. L. Oliver is the contractor on a Wilcox sand exploratory test which Jerigan & Morgan of Oklahoma City are starting at 1 Reim, NE NE SW 3-20n-4e, northern Payne County, Oklahoma. Projected depth is 4,100 ft.

Perl Smith is the contractor on the Dakota series wildcat test which C. D. Edmonson is drilling in the area 8 miles northeast of Chappell, Deuel County, western Nebraska. The operation is 1 Lindsay, with location in the NW NW NW 4-12n-44w. Location is 12 miles west of the Big Springs gas field.

Sharp Drilling Co., Farmington, N. M., is starting a Pennsylvanian test for Tide Water Associated Oil Co. at 1 Unit, C SE SE SW 8-33n-14w, on the Johnson Canyon prospect in Montezuma County, Colorado.

Mora Drilling Co., Tulsa, has a contract with Mid-Continent Petroleum Corp. calling for deepening one of the latter's former Wilcox sand producers in the Edmond pool, Oklahoma County, Oklahoma, to the Arbuckle lime. The well is 2 Young, SW SW NE 31-14n-3w. Present total depth is 6,694 ft.

Service Drilling Co., Tulsa, is drilling The Texas Co.'s second test in the North Lodgepole area of eastern Cheyenne County, Nebraska. Location, in the NE SE NW 15-15n-47w, is about 1¾ miles west of the first test, quit at 4,690 ft. The new operation is 1 Haxby.

Decem Drilling Co., Oklahoma City, has the contract and is a partner with Allied Materials Corp. in the drilling of a wildcat test being started about 5 miles northwest of Dover, Kingfisher County, western Oklahoma. The test, 1 Hobbs, C NW NE 30-18n-7w, is projected to the Hunton lime or 8,500 ft.

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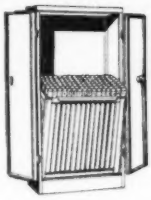

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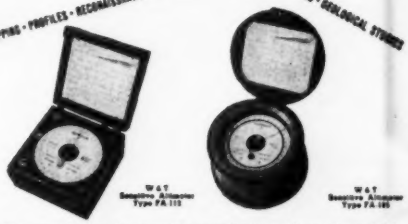

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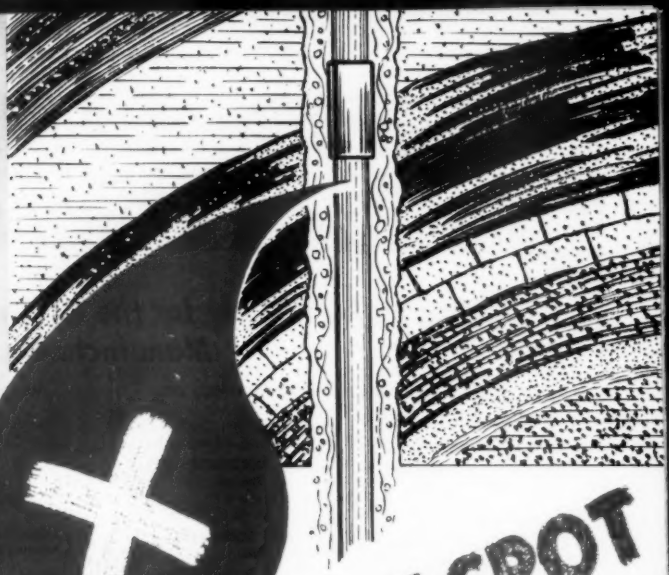

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West of the Pecos

WEST of the Pecos River in Texas there is a vast, sparsely tested region that geologists look upon as offering possibilities of becoming an important oil-producing area.

This region, south and west of a buried foreland range known as the Central Basin platform, is called the Trans-Pecos province. Within this province are several major tectonic features, the most interesting appearing at the present time is the Delaware basin and its eastward extension, the so-called Sheffield channel, which at various times during geologic history is believed to have connected the Midland and Delaware basins.

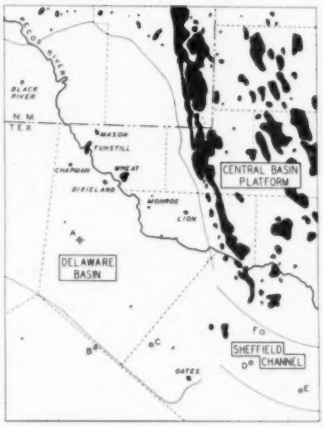
Acreage in this area, cheap by Texas standards, has been leased rather thoroughly in anticipation of the activity that geologists foresee for the region.

There are a few small oil fields within the as yet doubtful outlines of the Delaware basin. They are all producing from Permian-Delaware Mountain rocks except for a few even less spectacular pools that produce from younger sediments.

The post-Delaware Mountain section is composed principally of evaporites in the Delaware basin and not much chance for significant production is credited to these sediments. Though older Permian rocks (especially the Wolfcamp) appear more favorable for the accumulation of oil, it is in pre-Permian rocks that the big oil is expected to be found.

A significant fact about the basin is that the few wildcats that have dug into pre-Permian rocks have yet to find any reasons why the Delaware basin shouldn't yield some big fields. The formations productive across the platform in the shallower Midland basin are present in the proper facies. However, except on the western slope of the basin the most promising pre-Permian formations (Pennsylvanian, Siluro-Devonian and Ellenburger) are deep. Of current interest in this connection is Continental 1 Wright (A on map) which was recently completed dry at 13,007 ft. Pre-Permian formation tops in this wildcat were: Pennsylvanian 11,385 ft., Woodford 12,180 ft., and Devonian 12,560 ft.

Continental's deep test is also illustrative of the method of attack that will have to be used to open this basin. The wildcat had no geophysical background of any kind. It was located on the basis of general subsurface geology for which data are skimpy at the best.



Rank wildcats drilled to over 10,000 ft. without the benefit of some kind of surface geological work or geophysical data are rare, but unless geophysicists find a way to "shoot" the Delaware basin there are going to have to be a great number drilled to find the pre-Permian oil believed to exist there.

Though geophysicists are confident that they can work out methods of solving their problems here as they have in other areas once the demand for their surveys becomes sufficiently great, it appears as though someone is going to have to make a significant pre-Permian strike to supply this incentive.

Keyed wells drilling in the area are: (B) Stanolind Oil & Gas Co. 1 McCutcheon, a 10,500-ft. test now digging below 5,400 ft.; (C) Gulf Oil Corp. 1 Fulcher, a 5,500-ft. test now drilling below 1,500 ft.; (D) Gulf 1 Winfield, now fishing at 14,008 ft.; (E) Phillips Petroleum 1 Glenna, digging Pennsylvanian rocks below 10,000 ft. on a projected 14,500-ft. test; and (F) Sinclair Oil & Gas Co. 1 University Pecos, a projected 7,500-ft. test location.

Philip C. Ingalls.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

WEST TEXAS.—Martin County production gained further significance as Tide Water Associated Oil Co. 1 Dickenson developed considerable clean oil on first drill-stem tests in the Ellenburger. The discovery had previously tested oil in the Spraberry and the Devonian. Magnolia Petroleum Co. 1 Chilton, Gaines County, was swabbing and flowing oil from a deep Pennsylvanian reef section. Cities Service Oil Co.-Continental Oil Co. 1-AM University added Spraberry pay to Flat Rock Ellenburger field and extended Upton County trend 8 miles south.

ROCKY MOUNTAIN AREA.—Shell Oil Co.'s discovery in northeastern Montana flowed at the rate of 80-100 bbl. of oil per hour on initial tests, but production reportedly dropped substantially. Shell is moving in drill pipe to deepen the well. Amerada Petroleum Corp. completed the Beaver Lodge, North Dakota, discovery flowing 12 bbl. of oil per hour. New discoveries in Wyoming were made by P. T. Sharples at Southeast Meadow Creek, Johnson County, and General Petroleum Corp. at Manderson, Big Horn County.

CALIFORNIA.—Jergins Oil extended San Ardo field of Monterey County ½ mile to the southeast (the third such extension in recent months), and Lloyd Corp., Ltd., extended Ventura Avenue field the same distance eastward. Attempted confirmation of the newly discovered Camden field, Fresno County, proved disappointing when a south offset venture found the thick pay zone pinched out.

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Kansas

Second Pool Indicated For Gove County

GOVE County, in the far western part of the state and a recent addition to the producing counties of the state, has prospects of another pool, its second, where Glenn Nye Drilling Co. found promising oil showings in Mississippi lime at its 1 Lundgren, NW NW NW 29-14-29.

Location of this new prospective discovery well is 3 miles southwest of Cities Service Oil Co. 1 Coberly, NW SE SE 15-14-29, completed late in June as the discovery well of the Coberly pool, first production in the county.

Mississippian in the Glenn Nye well was topped at 4,262 ft. (—1,673 ft.). A drill-stem test, open 1 hour, in this zone at 4,278-88 ft., got 75 ft. of free oil. Casing has been run for completion. The Cities Service well produces from the Marmaton zone (Pennsylvanian), in which casing was perforated at 4,304-11 ft.

Testing is under way at Flynn Oil Co.'s wildcat, 1 Petersilie, SW SW SW 11-20-24, in Ness County, which adjoins Gove County on the south. After acidizing its prospective Mississippian pay, topped at 4,434 ft. (—2,094 ft.) and open at 4,437-57 ft., the well swabbed at the average rate of 2½ bbl. of oil per hour. It since has been shot and is cleaning out. This well is 10 miles southeast of the Manteno pool, nearest production, and 14 miles northwest of the Jetmore pool, Hodgeman County, opened a year ago as the later county's first production.

Westgate-Greenland Oil Co. 1 Wetig, NW NW SE 2-22-14, a wildcat in northwestern Stafford County, flowed at the rate of 20 bbl. of oil per hour from casing perforations at 3,477-93 ft. and 3,530-43 ft. in the Lansing-Kansas City lime section. In previous tests of Arbuckle lime, topped at 3,760 ft. and drilled to 3,813 ft., it swabbed 2½ bbl. of heavy oil per hour. Elevation is 1,933 ft. Location is about 1½ miles west of production in the Curtis pool.

Jones, Shelburne & Farmer have what looks like a good well at their 1 Teall, SE SE NW 18-10-21, southern Graham County wildcat. The hole filled 2,700 ft. with oil in 12 hours after plug was drilled to test Arbuckle lime, topped at 3,909 ft. (—1,604 ft.). Hole is open at 3,911-23 ft. Nearest production is in the Smith-Denning pool, 2½ miles to the northeast.

Bay Petroleum Corp. and Musgrove Petroleum Corp. are putting 1 Holm, NW NW NW 32-16-3, South Central Saline County, on the pump after swabbing tests in which it averaged 2 bbl. of net oil per hour with water estimated at less than ½ bbl. per hour. Pay zone is the Maquoketa, in which casing is perforated at 3,406-12 ft. Top of the zone is 3,409 ft. (—2,049 ft.).

KANSAS SUCCESSFUL WILDCATS

Ellis County: Carter 1 Weisner, SE SE SE 11-12s-18w, 245 bbl. 31.2°-gravity oil from 3,372-78 ft., 3,392-3,408 ft., and 3,437-48 ft., TD 3,622 ft., OWWO, new zone in Walters field.

Rooks County: Derby-Champlin 1 Annon, SW SW NE 27-10s-20w, pumped 331 bbl. oil from Arbuckle at 3,711-17 ft., TD; Heebner 3,370 ft., Lansing-Kansas City 3,418 ft., base Kansas City 3,626 ft., Sooy 3,659 ft., Simpson 3,696 ft.

Seward County: Heber 1 Lofland et al, CSL SE NW 18-25s-31w, 3,549 M.c.f. gas plus 14 bbl. distillate per M.m.c.f. from Morrow sand at 5,995-6,015 ft., TD 8,006 ft., OWWO.

KANSAS WILDCAT FAILURES

Barton County: Ash-Smith 1 Felder, NW NW NE 3-19s-11w, dry, TD 3,421 ft.

Lario Oil & Gas 2 Birzer, SW SW SW 17-19s-11w, dry, TD 3,394 ft.

Pickerell 1 Rugan, NW NW SE 28-20s-11w, dry, TD 3,390 ft.

Brown County: Woods 1 Spiker, NE NW NW 6-4s-15e, dry, TD 3,708 ft.

Butler County: Gaty 1 Bennett, NE SW SW 25-27s-3e, dry, TD 3,022 ft.

Chase County: Edwards 1 Crosby, NE NE NW 23-22s-9e, dry, TD 2,464 ft.

Dickinson County: Continental 1 Howie, SW SW NE 10-15s-1e, dry, TD 3,292 ft., strat test.

Ellis County: Anschutz 1 Bowlby, SE SE NW 23-11s-16w, dry, TD 3,510 ft.

Palmer 1 Hill, SW SE SE 12-12s-17w, dry, TD 3,738 ft.

Murfin et al 1 Brungardt, NE NE NE 26-14s-17w, dry, TD 3,505 ft.

Graham County: Gore 1 Stites, SE SE NE 1-10s-23w, dry, TD 4,140 ft.

Pyramid 1 Kerman, NW NW NW 35-10s-23w, dry, TD 4,102 ft.

Morris County: B&R-Sohio 1 Hogewaning, SW SW NW 29-15s-5e, dry, TD 2,331 ft.

Nemaha County: Woods 1 Whaley, NW NW NE 34-4s-13e, dry, TD 3,933 ft.

Norton County: Great Lakes Carbon 1 Minshall, SE SE SE 35-1s-23w, dry, TD 3,785 ft.

Rice County: Hogan et al 1 Siemsen, SE SE NW 18-18s-8w, dry, TD 3,455 ft.

Rooks County: N.C.R.A. 1 Hance, NE SW SW 14-8s-19w, dry, TD 3,400 ft.

Jones-Shelburne & Farmer 1 Sutor "B," NE NE SW 5-10s-19w, dry, TD 3,885 ft.

C&G 1 O'Brien, NW NW SW 27-10s-19w, dry, TD 3,741 ft.

Sumner County: Alpine 1 Brownback, NE NE SW 5-34s-2w, dry, TD 4,747 ft.

Trego County: Davis 1 Demurray "B," SE SE NW 3-11s-22w, dry, TD 3,957 ft.

Davis 1 Baker, SE SE SE 30-11s-22w, dry, TD 4,120 ft.

IOWA WILDCAT FAILURE

Harrison County: Hall et al 1 Johnson, SE SE NE 18-81n-44w, dry, TD 2,057 ft., Pennsylvania lime 133 ft., asphaltic shows of oil and gas bubbles, Keokuk 460 ft., Burlington 535 ft., Gilmore City 590 ft., Hampton 690 ft., Means Creek 710 ft., Maple Hill 820 ft., Hunton 870 ft., Maquoketa 1,245 ft., Elgin 1,380 ft., Viola 1,525 ft., Simpson 1,620 ft., St. Peter 1,657 ft., Arbuckle 1,714 ft., New Richmond 1,805 ft., Gordon sand 1,880 ft.

Texas Gulf Coast

Liberty County Production In Hull Field Extended

HOUSTON.—Production in Hull field of Liberty County has been extended 660 ft. to the north at John W. Mecom 9-D Merchant, in H&TC Survey, Abstract 194, 1,988 ft. from south line and 660 ft. from east line of 177.9-acre lease.

Well flowed 179.69 bbl. oil per day on ⅛-in. tubing choke from perforations 48 shots at 8,542-50 ft. Tubing pressure was 1,140 psi., casing pressure 1,550 psi. Gas-oil ratio was 680:1, gravity of the oil 32.2°. Hole is bottomed at 9,086 ft. with 5½-in. production string cemented on bottom. Sun Pipe Line will take the oil.

Flowing 79.35 bbl. of 38.3°-gravity oil per day on 8/64-in. choke, Houston Oil Co.-American Republics Corp. B-3 Hankamer has been completed as a confirmation test to the discovery of the Camptown field in Newton County. Production is from casing perforations 7,225-26½ ft. with 11 shots. Tubing pressure on the test was 660 psi., gas-oil ratio 537:1. Flow was accompanied by 40 per cent water. Total depth of the confirmation is 7,350 ft. with production string cemented at 7,293 ft.

New pay has been indicated 100 ft. below the present field production in the Battle field of Victoria County, 13 miles southwest of Victoria. Cannan, Hawn Brothers, Liebman & Gibson have set casing and perforated in the 2 Pedro Pardo venture after coring new oil pay 4,879 to 85 ft. Operators bottomed out at 5,256 ft. and set casing to 4,953 ft.

Pool, Stofer & Fly 1 Wm. Prewitt Estate is a new semiwildcat test in the Berclair extension area near Magnolia gas production, southwestern Goliad County. Location is on a 142-acre lease in southwest part of Sampson McTonarl Survey, A-195. It scales 330 ft. from east line and 900 ft. from north line of the lease, being 3,150 ft. north of Blanco River and 2,000 ft. from northwest line of the survey. It is scheduled to go to a depth of 3,200 ft. for test of the Vicksburg zone.

Bridwell Oil Co. has set casing for completion in 2 J. G. Roundtree, northeast outpost test at Sliva field, in southern Bee County, after well tested gas in the Stillwell sand. Drill-stem test at 4,353-4,434 ft. developed 500-psi. working pressure after being open 5 minutes, blowing gas through ¼-in. chokes top and bottom.

Rowan & Hope 1 H. C. Gansow, second producer in the Henze area of southern DeWitt County, has been completed with perforations at 7,422-35 ft. The well flowed gas-condensate with shut-in pressure recorded at 2,700 psi. Well is waiting on potential, but is expected to make a good gas-condensate producer. Total depth is 7,594 ft. with 5½-in. casing set to 7,490 ft.

The Sparta Oil Co. and associates are drilling below 10,182 ft. in sand known as the "L" sand at 1 Lawrence A. Johnson, wildcat 7 miles south of Rock Island in Colorado County, and operators plan to drill to 10,500 ft., run electrical survey pending further drilling. Last survey was run at 9,092 ft. Minor gas shows were logged at 8,930 ft., and gas shows were encountered at 9,798 ft. in 97 per cent sand. Logging truck now on the well has recorded only slight gas shows in the "L" sand, typical of the Wilcox formation.

Wildcat is on 667-acre lease in I&GN Survey, Abstract 312, and scales 660 ft. from south line and 660 ft. from west line of lease and survey. Elevation is 191 ft.

Sam G. Harrison has extended production in Neils Carlson field of Wharton County 1,500 ft. to the north with completion of his 3 Henry Cihas et al, 660 ft. from north and east lines of southwest quarter Section 13, M&C Survey, Abstract 282.

Well flowed 112.75 bbl. oil per day on ⅛-in. tubing choke from perforations 5,241-46 ft. with 50 shots. Tubing pressure on the test registered 578 psi., gas-oil ratio 612:1. Gravity of the oil is 27°. Hole was drilled to total depth 5,475 ft. and cased to 5,234 ft. with 5½-in. string. Elevation at the drill site is 81 ft., with top of pay called at 5,234 ft.

New wildcat for Hardin County is American Republics Corp.-Houston Oil Co. of Texas 1 Mary J. Cunningham et al, on 147-acre lease in O. C. Nelson League, Abstract 40, 8 miles north of Silsbee. Drill site is 330 ft. from south and west lease lines, and scales 4,400 ft. from west line and 1,650 ft. from north line of survey, Zingery coordinates being G-3 on east half of county map. Production will be sought to 8,850 ft. Elevation is 109 ft.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCAT

Bee County: O. Neathery, Jr., et al, 1 C. C. Diebel, oil, Carmen Molina Sur. A-39, TD 4,512 ft., IP flowed 66.4 bbl. per day, ⅛-in. choke, CP 1,390-1,400 psi., TP 970-1,000 psi., GOR 2750:1, 50° gravity.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Bee County: Well Service & Drilling Co. of Texas 1 T. J. Heard, dry, F. Dietrich Sur., A-150, TD 6,095 ft.

Goliad County: L. A. Douglas 1 C. E. Kerlick, dry, James Hughes Sur. A-146, TD 5,510 ft.

Live Oak County W. R. Quin 1 R. C. Boettcher, dry, Refugio County School Land Sur. 111, TD 4,790 ft.

Fred W. Shield and Tide Water Associated Oil Co. Fred C. Jeffrey, et al, Unit, dry, Section 94, Simmons Subd., TD 7,606 ft.

Refugio County: Sam E. Wilson, Jr. 2 Rogers Est., dry, James Powers Sur., A-50, TD 6,374 ft.

Liberty County: S. A. Brewster and W. O. Bartle, et al, 1 B. H. Willis Est., dry, T&NO Sec. 15, A-396, TD 8,500 ft.

The Texas Co. 3 Martin Zalesky, dry, E. R. & R. H. Miller A-734, TD 1,792 ft.

Matagorda County: Brazos Oil & Gas Co.

PA-4 State of Texas, dry, Matagorda Bay Sec. 173, TD 5,751 ft.

Montgomery County: Capital Co., et al, 1 Alliance Trust Co., dry, Thomas Corner A-10, TD 11,500 ft.

Orange County: John W. Mecom 1 The Port of Beaumont Navigation Dist., dry, G. Stephenson A-167, TD 9,545 ft.

San Jacinto County: Floyd L. Karsten 1 Ava Cruse, dry, H&TC RR A-165, TD 8,618 ft.

Mississippi

Adams County Test Runs Potential in Wilcox Zone

JACKSON. — A new Wilcox discovery is running potential test at the R. J. Bartlett-Kemp Drilling Co. B-1 Minter, Section 52-5n-1w, Adams County. Completion is being made from perforations 6,698-6,700 ft. On drill-stem test of these perforations, the well flowed 6 bbl. of oil per hour through $^{3}/_{8}$-in. bottom choke and 12/64-in. top choke with top pressure 480 psi.

Bottom-hole pressure was 2,775 psi. flowing and 3,350 psi. shut in.

At last report, tubing had been run and well was flowing 5 bbl. of 34.8°-gravity oil per hour on 9/64-in. choke with tubing pressure 360 psi. On this early test the well was still making 5 per cent wash water. This performance is exceptionally good for the thin oil sand which was perforated.

The drilling of this discovery well was backed by The California Co., Stanolind, Skelly, and Sohio, who have acreage in the area.

The South White Apple field discovery well, Dave Gammill-Lyle Cashion Co. 1 D. F. Anderson, Section 3-5n-1e, Franklin County, which has been flowing a small amount of oil through casing, has now died and operators will move in a work-over rig and run tubing for a normal completion attempt. After casing was perforated the well started to flow through casing and operators were unable to get tubing in the hole.

In Jefferson County approximately 6 miles southeast of Fayette, Southern Production Co. and Tide Water have run log to 5,875 ft. and are preparing to core at 1 F. Krauss & Sons, Wilcox wildcat located in Section 45-8n-2e. A total of 29 sidewall samples were taken 4,214-5,822 ft in the Wilcox with recovery being sand with no show. Base of Big shale was picked on log at 5,556 ft., minus 5,076 ft., which is 24 ft. higher structurally than same point in the Clements, et al, 1 Wagner, dry hole located approximately 1½ miles north in Section 24 of same township.

MISSISSIPPI WILDCAT FAILURES

Adams County: Gulf Refining Co. 1 G. W. Armstrong et al, Sec. 5-4n-3w, dry, TD 7,495 ft.

Sinclair Oil & Gas Co. 1 Hogue Estate Sec. 5-4n-4w, dry, TD 7,023 ft.

Grenada County: John F. Bill 1 Ben W. Townes, Sec. 34-23n-4e, dry, TD 412 ft.

Jones County: A. R. Temple 1 Howard L. Collins Sec. 10-7n-12w, dry, TD 8,896 ft.

Madison County: The Texas Co. 1 Federal Land Bank Sec. 36-8n-1e, dry, TD 6,600 ft.

Wayne County: Harris & Payne-L. Cashion Co. 1 G. M. & O. Land Co. Sec. 3-9n-9w, TD 5,607 ft.

Michigan

Mecosta County Wildcat Reports Stray Gas Show

MOUNT PLEASANT. — Gas, showing through a hole full of rotary drilling mud, was reported at Merrill Drilling Co. and Wm. B. Darke 1 Fate & Weis et al, SW NW SW 27-15n-7w, Sheridan Township wildcat, Mecosta County.

Gas was reported to have been logged in Stray sand at about 1,476-90 ft., above the Stray sand which is being produced or being used for gas-storage in many Michigan areas.

An attempt was being made to test this Stray sand with 7-in. casing set on a packer, but the packer was reported not setting up properly to allow for an effective shutoff. Hole is presently bottomed out for this test at 1,506 ft., where drilling operations were standardized for testing and probable deepening on to the Dundee oil objective. This gas showing from a sand body above the Michigan Stray is not uncommon in the Michigan basin, but it has seldom, if ever, proved to be commercial.

The first followup to Howard D. Atha's 1 Carlson, Traverse oil-discovery well, Douglas Township, Montcalm County, was dry in this objective zone.

The failure was at Cities Service Oil Co. 1 Hansen, NW SW SE 26-11n-7w, the diagonal northeast offset to the Carlson producer. Traverse lime at the 1 Hansen was logged at 2,892 ft., and Alpena Traverse zone, the pay horizon in the discovery, was logged at 2,904 ft. Hole was bottomed out dry at 3,096 ft. This failure was reported to be about 5 ft. higher structurally on the Traverse lime top, Schlumberger survey correlation, than the discovery producer. The only show reported at the Cities Service offset was after a 60-minute drill-stem test at 2,951-88 ft. where 10 ft. of slightly gas-cut drilling mud was recovered.

MICHIGAN WILDCAT FAILURES

Allegan County, Casco Township: Louis Zellman 1 Adkins, NE NE NE 14-1n-16w, Traverse 1,210 ft., dry, TD 1,214 ft.

Hopkins Township: Booher, Cady & Harry Stroud 1 Hazen, SE SW SE 25-3n-12w, Traverse 1,670 ft., dry, TD 1,705 ft.

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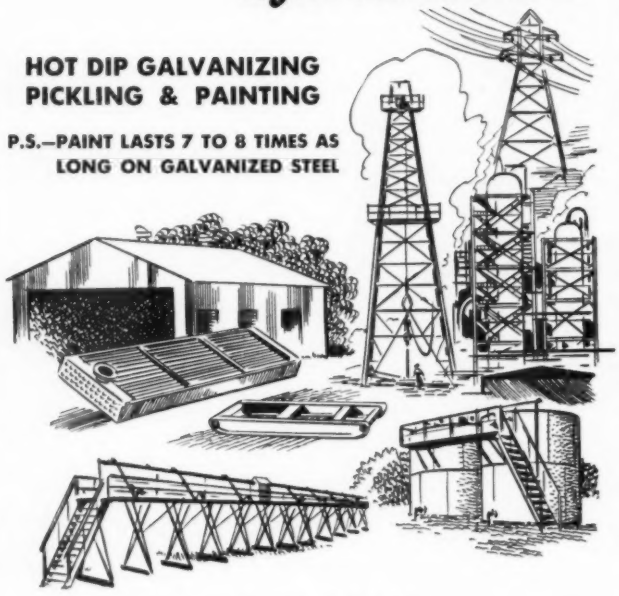

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Monterey Township: Chester Anderson 1 Moore, SE NE SW 35-3n-13w, Traverse 1,570 ft., dry, TD 1,614 ft.

Mason County, Hamlin Township: Edward Wagner & Neil Wagenaar 1 Boswell, NW NE SE 3-18n-18w, Monroe 2,016 ft., dry, TD 2,045 ft.

Missaukee County, Aetna Township: W. R. Swetland 1 State-Aetna, SE SE NW 23-2n-6w, dry in Richfield, TD 5,425 ft.

Newaygo County, Barton Township: Pure Oil Co. 1 Cooper, SW SW NE 34-16n-11w, Dundee 3,487 ft., dry, TD 3,697 ft.

Sherman Township: Sun Oil Co. 1 Greig-Heneberger-Wood, SE SW SE 5-13n-13w, Traverse 2,299 ft., dry, TD 2,364 ft.

Ottawa County, Spring Lake Township: E. L. Bourret 1 Drouillard, NW SW NW 3-8n-16w, Berea 940 ft., dry, TD 1,010 ft.

Roscommon County, Roscommon Township: Taggart Brothers Gas Co. 2 Hilliard-State-Alderman, NW 20-22n-4w, Stray sand 1,101 ft., dry, TD 1,110 ft.

South Louisiana

Orleans Parish Wildcat Completed as Gas Discovery

NEW ORLEANS.—The Texas Co. has completed 1 State-Lake Borgne, wildcat in Orleans Parish, as a shut-in gas discovery. Well flowed 3,198,000 cu. ft. gas per day on 3/16-in. tubing choke on initial-production test. Production is from 192 casing perforations from 7,197 to 7,221 ft. Hole was drilled to total depth of 13,270 ft. and plugged back before perforations were made. Casing is cemented at 10,877 ft.

Locations for two wildcats in two parishes in South Louisiana have been staked by The Texas Co., operating out of its New Orleans office.

In St. John the Baptist Parish, The Texas Co. will drill 2 Joseph Rathborne Land & Lumber Co., Inc., 660 ft. north and 1,980 ft. east of the southwest corner of Section 2-13s-18e, on its Johnson prospect. Production will be sought to 12,500 ft. Firm drilled 1 Joseph Rathborne, in Section 84-12s-18e, to total depth of 12,071 ft. and abandoned the venture in November of last year after finding no commercial shows.

In Bay Tambour, Lafourche Parish, Texaco will drill 1 State Leeville East to a proposed depth of 13,000 ft. Located east of production in Leeville field, drill site is south 1,650 ft., west 2,500 ft. from USC&GS Monument "Bour" 1927-1934, with location falling in Township 21s-23e.

Atlantic Refining Co. has reached total depth at 1 W. E. Walker, wildcat about 1 mile north of production in Woodlawn field of Jefferson Davis Parish, in Section 2-9s-6w. The well is at total depth 12,849 ft., and crews are awaiting orders. Originally projected as an 11,200-ft. exploratory venture, no shows have been reported in drilling to tota depth.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Beauregard Parish: William Herbert Hunt 1 Powell Lumber Co., 36-6s-12w, oil, TD 9,165 ft., IP: flowed 132 bbl. per day plus 289,000 cu. ft. of gas per day, 1/8-in. choke, TP 1,550 psi., CP 2,040 psi. GOR 2,113:1, 42.9° gravity.

Washington Parish: Humble Oil & Refining Co. C-1 Gaylord Container Corp., 47-1s-14e, gas-distillate, TD 9,059 ft., IP: flowed 292.92 bbl. per day, plus 6,920,000 cu. ft. of gas on 22/64-in. choke, GOR 23,422:1, flowing TP 3,025 psi., SITP 3,350 psi., CP 1,000 psi., 40.3° gravity.

SOUTH LOUISIANA WILDCAT FAILURES

Assumption Parish: Union Sulphur & Oil Corp. 1 E. G. Robichaux Estate, 100-14s-15e, dry, TD 13,388 ft.

Cameron Parish: Cities Service Oil Co. 1-C Laccassine, 12-12s-5w, dry, TD 9,948 ft.

Iberville Parish: Sohio Petroleum Co. 1

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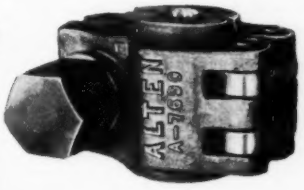

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J. H. Slaughter, 10-9s-13e, dry, TD 11,000 ft.

St. Landry Parish: Sun Oil Co. 1 St. Charles College, 84-7s-2e, dry, TD 10,250 ft.

Oklahoma

Eastern Logan County Gets New Wilcox Pool

J. G. AND W. F. CATLETT and associates have opened what appears to be a good second Wilcox sand pool in eastern Logan County where their 1 Giddings, SE NE NW 21-17n-1e, flowed 68 bbl. of 46°-gravity oil the first hour and then averaged 49½ bbl. per hour the next 5 hours with gas estimated at 2,000,000 cu. ft. per day. Placed on 7/64-in. choke, the well flowed 10 bbl. of oil per hour. Total depth is 5,082 ft. with hole open below 5,069 ft. Top of the second Wilcox is 5,070 ft. (elevation 803 ft.). Location is 3 miles east of Langston, 2½ miles north of the Northwest Iconium pool and 3 miles southwest of the East Coyle pool.

A new Bartlesville sand pool also is being opened in the next township to the west, also in Logan County, where Robert M. Jordan and Mitchell-Gage Drilling Co. 1 State, NE NE NW 16-17n-1w, swabbed and flowed at the rate of 50 bbl. of oil per day. Production is from open hole at 5,029-70 ft. Location is between the Langston and West Langston pools.

Flynn Oil Co.'s new Booch sand discovery well, 1 Best, NW NE NE 32-9n-7e, Seminole County, flowed 52 bbl. in 5 hours through open tubing, and 24 bbl. in 3 hours when placed on ½-in. choke for completion. The sand, topped at 3,388 ft., is open at 3,392-3,419 ft. The discovery is in the area southwest of the Twin Lakes pool, and about 1¾ miles southeast of production of the Seminole pool and a mile northwest of the Sancho pool.

Magnolia Petroleum Co. is continuing tests in its 1 Maurer, C NW SE 21-5n-5w, deep wildcat 3 miles southwest of the Northeast Bradley pool, Grady County. Latest test was from casing perforations at 10,502-522 ft., from which the well flowed 1,529,000 cu. ft. of gas per day through 18/64-in. choke. The well previously flowed 1,658,000 cu. ft. of gas and 24 bbl. of distillate per day from perforations at 10,536-554 ft.

Testing also is under way at Shell Oil Co.'s discovery well, 1 Tugman, NE SW NE 11-2n-8w, 2 miles west of Marlow, northwestern Grady County. From casing perforations at 7,510-7,600 ft., it flowed 69 bbl. of oil in 28 hours. The well has been killed to test higher zones. Best showings in drill-stem tests made during the drilling of the well were in a Hoxbar sand zone at 6,078-6,112 ft.

Continental Oil Co. 1 Adams-Von Weise, NW SW NW 15-2s-4w, and outpost test west of the Milroy pool and south of the Velma pool, also in Stephens County, swabbed 78.59 bbl. of oil in 24 hours while testing Eason sand, in which casing is perforated at 3,568-76 ft. and 3,584-3,600 ft. In previous tests of Tussey sand at 3,680-3,720 ft., it swabbed 121 bbl. of new oil in 24 hours.

OKLAHOMA SUCCESSFUL WILDCATS

Cleveland County: Producers Development Co. (was Sinclair) 1 J. B. White, C SE NE 20-9n-3w, flowed 180 bbl. 42.4°-gravity oil from Tulip Creek at 9,712-36 ft., TD 10,235 ft., Belle City 6,016 ft., Hogshooter 6,527 ft., first oolitic 7,001 ft., second oolitic 7,057 ft., Oswego 7,675 ft., Prue 7,703 ft., Mississippi lime 8,349 ft., Woodford 8,462 ft., Haragan 8,600 ft., Chimney Hill 8,845 ft., Sylvan 8,896 ft., Viola 9,014 ft., dense 9,298 ft., dolomite 9,328 ft., first Wilcox 9,383 ft., second Wilcox 9,398 ft., McLish 9,842 ft., Oil Creek 9,921 ft., second Oil Creek 9,966 ft., Joins 10,152 ft., old dry hole drilled deeper, OTD 8,904 ft.

Lincoln County: Duncan & Schonwald 1 Kent, NE NE SE 28-17n-3e, flowed 117 bbl. 40°-gravity oil from Red Fork at 4,031-44 ft., TD; Hogshooter 2,980 ft., Checkerboard 3,250 ft., Big lime-Oswego 3,730 ft., Prue 3,881 ft., Verdigris 3,922 ft., Skinner 3,928 ft., extension to SE Sporn.

OKLAHOMA WILDCAT FAILURES

Carter County: Nelson & Spain 1 Barkett, NE SW SW 27-4s-2w, dry, TD 3,290 ft., geological test in Hewitt field.

Comanche County: Farris 1 Fox, NE SE NW 23-1n-10w, dry, TD 2,409 ft.

Cotton County: Ross 1 Whitehead, SW NW NE 28-3s-12w, dry, TD 2,002 ft.
Ross et al 1 Willis, NE NE SW 19-4s-9w, dry, TD 2,507 ft.

Garvin County: Van Grisso and Republic Natural Gas 1 Harris, NE NE SW 25-4n-3e, dry, TD 2,843 ft.

Grady County: Peppers and Carter 1 Fritts, NW SW SW 31-3n-8w, dry, TD 8,010 ft.

Kay County: Mazda and Gulf 1 State, SE SE SW 36-28n-1e, dry, TD 4,060 ft.

Kingfisher County: Wagoner Oil 1 Cook, NW NW NW 12-19n-6w, dry, TD 910 ft.

Lincoln County: Allen et al 1 Dumas, NE NE NE 6-16n-3e, dry, TD 4,270 ft.

McIntosh County: Pine 1 Harjo, SE SW NE 9-10n-13e, dry, TD 3,238 ft.

Noble County: Helmerich & Payne 1 Burt, NE NW SE 9-24n-3e, dry, TD 4,140 ft.

Pontotoc County: Absher & Booth 1 Newby, SE NW SW 20-5n-4e, dry, TD 2,718 ft.

Pottawatomie County: Thomas et al 1 Deister, NE NE SW 21-6n-5e, dry, TD 4,015 ft.

Stephens County: Atkinson 1 Edwards, NW SE SW 10-3s-6w, dry, TD 2,401 ft.
Atkinson 1 Edwards "A," SW SW NW 15-3s-6w, dry, TD 2,770 ft.

Tillman County: Sunray 1 Chanate, NE NE SW 28-4s-15w, dry, TD 4,712 ft.

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Southwest Texas

Nueces County Wildcat Drill-Stems New Oil Pay

CORPUS CHRISTI—Free oil and some salt water resulted from a drill-stem test to indicate a new pay discovery at Renwar Oil Corp. and Phillips Petroleum Co. 1 J. C. Blacknall, slated 6,500-ft. wildcat in extreme northern Nueces County, 330 ft. west of the Nueces River. Tool was open 20 minutes at 6,098-6,101 ft., using 3/16-in. and ¼-in. chokes. Working pressure was 84 psi. Recovery was 30 ft. of mud, 770 ft. of oil, and 150 ft. of salt water. Bottom-hole flowing pressure was gaged at 2,390 psi. and shut-in pressure at 2,625 psi.

Seaboard Oil Co. of Delaware is to start shortly on an east extension attempt to the Luby field of Nueces County. Fee name is the 53 James P. Luby, located 787 ft. from the north line and 2,800 ft. from the east line of Section 3, Block 1, Mary J. Luby Subdivision of the east part of the Petronilla Ranch. Drill site is on a 1,114-acre lease 10½ miles east of the town of Bishop. Nearest Luby production is about 1,500 ft. to the west. Proposed depth is 5,100 ft.

A drilling program involving four new wildcat tests has been set for the area west of Gardendale in northwestern La Salle County, where Henderson Coquat and O. R. Mitchell, of San Antonio, recently discovered Carrizo-sand oil production. The four tests will be drilled by separate operators, with two to begin right way, and the other two to await rigs from the first two. The four locations completely bracket the new discovery, one being about a mile west, one a mile east, one about 2 miles north, and the other about 2 miles south of the new discovery. The one located south of the discovery will be a Navarro-sand test, the others will be Carrizo-sand tests.

Amerada Petroleum Corp. is preparing to set casing on the Buda lime in its 1 Florence Schuelke wildcat in southeastern Bastrop County for a test of the Buda section.

Commercial oil production at the Texas Co. 1 Erich E. Fischer has extended Hollow Tree field of Jim Wells County to the northeast. At total depth of 4,301 ft. and with 5½-in. pipe set at 3,433 ft., the venture was tested through perforations at 3,370-75 ft. and flowed 132 bbl. of oil per day on a 16/64-in. choke. Gravity was 24.7° and gas-oil ratio 338:1. This section showed signs of production on previous tests, but the above development is the first flow reported.

East Zapata County was the site of stepped-up drilling activity as two wildcats, one projected to 6,500 ft., and one semiwildcat were staked in the area.

The Texas Co. has made location for the 6,500-ft. test, 1 Fernando Cuellar et al, on a 640-acre lease in E&F Cuellar Survey, A-208, about 10 miles east of the town of Bustamente. Drill site is 1,320 ft. from the southeast line and 660 ft. from the southwest line of the survey, which puts it 1,725 ft. east-northeast of Union Production Co. 10 Cuellar, dry hole. It is about 5 miles southwest of Cuellar field.

Operations are to start shortly on a deep wildcat in northeast Nueces County by Aransas Dock & Channel Co., of Aransas Pass. It will be the concern's 1 Aransas D&C Co., staked on a 240.35-acre lease in Survey 652 and scaling 660 ft. from east line and 660 ft. from north line of the Survey, which puts it about 2½ miles east of Aransas Pass. Projected to 9,000 ft., the test lies approximately 1,000 ft. south of the causeway and 3 miles southeast of McCampbell field, nearest production. Shell Oil Co. holds offset acreage to the east and south.

The G. W. McCarter 1 H. E. Mofield wildcat will be drilled to 1,800 ft., 3½ miles from Yancy in the southwestern part of Medina County. Location is on a 428-acre lease out of the J. F. Torrey Survey 112 and scales 1,466 ft. from the west line, 2,290 ft. from the south line, and 950 ft. from the east line of the lease.

New wildcat for the Corpus Christ Bay, Nueces County, is slated by Stanolind Oil & Gas Co., which recently developed commercial production in the area at its 1 State Tract 421. The new venture, the company's third since the discovery showing, will be the 1 State 451, 2⅝ miles southwest of the pay opener. Location is on a 320-acre lease, scaling 1,500 ft. from the southwest and 1,250 ft. from southeast lines of State Tract 451, about 10 miles east of Corpus Christi. Contract depth is 9,500 ft.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCAT

McMullen County: Sunray Oil Corp. 1 A. M. Hostetter Condensate, Justo Corona Sur. 68 A-1122, TD 10,244 ft., IP: flowed 6,000,000 cu. ft. per day on open flow; GOR 40,000:1, no water.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Atascosa County: Harris S. Stahl 1 Ed Jendrusch, dry, A. Houston Sur. 197, TD 3,255 ft.

Duval County: J. N. Abel, et al, 1 Liela Peters, dry, L. Munos Sur. 2 S-142, TD 2,367 ft.

Gorman, McCarrick, Trustee, 1 Alice Wright, dry, W. H. Gibson Sur. A-266, TD 6,313 ft.

The Texas Co. A-1 DCRC NCT-5, dry, Estevan Barrera Sur. 908, TD 3,005 ft.

Jim Hogg County: Sun Oil Co. 43 A. C. Jones, dry, Agua Nueva De Abajo Grant, TD 4,750 ft.

Seaboard Oil Co. of Delaware 1 L. A. Hinnant, dry, Las Animas Grant, TD 3,460 ft.

Jim Wells County: S. H. Howell 1 Charles Sharke, dry, J. J. Summers Subd., TD 5,200 ft.

Nueces County: C. Singleton Drilling Co. 1

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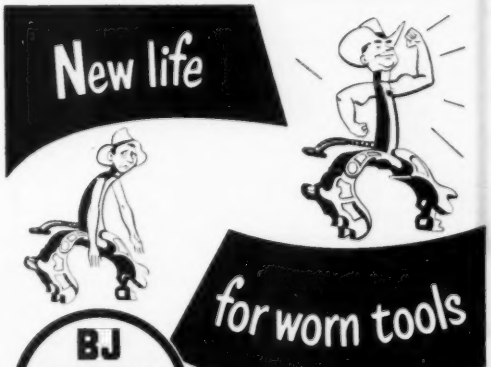

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E. Jones, dry, Tract 5, Wallantine Farm Tracts, TD 6,470 ft.

Starr County: Herman H. Sampson 1 Perez et al, dry, Tract 5-B Porc. 74, TD 1,146 ft.

California

San Ardo Field Gets Third Recent Extension

LOS ANGELES.—Productive limits of San Ardo field, Monterey County, were extended about ½ mile to the southeast, the third such extension recorded there in the past few months.

Already having a backlog of around 100 proved undrilled locations, the continued addition to the field's productive limits assures continued activity for months to come. Currently 8 rigs are at work there, each completing new producers at the rate of about one well every 10 days. Because of limited pipe-line outlet, some producers completed in June and May are just now being placed on production.

Latest extender was the Jergins Oil Co. 116-18 Hambey, in Section 18-23s-11e, about ½ mile south of production on the southeast end of the field. It was completed as a 70-bbl. pumper in the Lombardi sand at 2,155-2,205 ft.

Productive limits of Ventura Avenue field also were extended about ½ mile east upon completion of Lloyd Corp., Ltd., 1 William Sexton. It was the third successive easterly stepout completed by Lloyd in the past year, altogether resulting in oil production being extended about 2 miles. The Sexton was completed as a 46-bbl. pumper, producing from perforations at 12,645-12,850 ft. with hole drilled to 13,058 ft. and plugged back to 12,890 ft. A free pump was set at about 11,500 ft., the deepest such pump set to date in any well.

In Elk Hills field, Standard Oil Co. of California has reached a depth of about 11,500 ft. at its X-55 30-R, which may be carried to 14,000 ft. In coring a fractured shale section at 11,130-11,470 ft., drilling was halted to run a formation test of this interval. The packer failed on the first test but the tool was being run again at the week end.

The deep test earlier this year indicated it would make a large oil producer and establish production in the Caneros zone, some 2,500 ft. below the regular deep Stevens pay. On a drill-stem test at 9,278-9,363 ft. the well flowed black oil and condensate at an estimated daily rate of several hundred barrels. After further testing and coring, 9⅝-in. casing was set at 9,610 ft. and drilling continued.

A confirmation test at Camden field, Fresno County, discovered by Elmer Von Glahn 1 Coleman Community about a month ago, proved disappointing. Drilled to 7,040 ft., the south offset found the 6,100-ft. pay largely pinched out. Hole then was plugged back to 4,775 ft. and the operator set a whipstock for redrilling to the northeast. Located in Section 8-17s-20e, the well is the 2 Coleman Community.

Among the new wildcats getting under way was the Seaboard Oil Co. 74-34 Seaboard-S. A. & F. L. about 3½ miles southeast of Raisin City field in Fresno County. Location is in Section 34-15s-18e.

In the generally mountainous area between southeast San Joaquin Valley fields and those in upper Santa Clara Valley, Continental Oil Co. was grading location for a wildcat near Gorman. Location is near the Ridge Route, Highway 99, in Section 29-7n-17w, or about 11 miles north of Castaic Junction activity. Continental reportedly has blocked some 25,000 acres in this area.

CALIFORNIA WILDCAT FAILURES

Kern County, Ant Hill area: J. H. Maurer & A. C. Fisher 8 Linda, 11-29s-29e, dry, Valv. Calif. 673 ft., TD 1,009 ft., elev. 635 ft.

East Edison area: G. J. Green 1 Green, 20-30s-30e, dry, TD 1,436 ft., elev. 825 ft.

Mountain View area: Rothschild Oil Co. 1 McKean, 12-30s-28e, dry, TD 4,030 ft., elev. 419 ft.

Tejon Ranch area: B. K. S. Oil Co. 11A-12, 12-10n-19w, dry, Santa Margarita 1,520 ft., Valv. Calif. 2,438 ft., TD 2,796 ft., elev. 1,025 ft.

Kings County, Armona area: Tide Water Associated Oil Co. 8-13 Gomes & Silveira, 13-18s-20e, dry, Kreyenhagen 7,945 ft., Domengine 8,251 ft., TD 8,786 ft., elev. 245 ft.

Pyramid Hills area: Harris Investment Corp. 1 Thunderbird, 30-23s-18e, dry, bottomed in Pliocene, TD 548 ft., elev. 603 ft.

Orange County, Brea-Olinda area: Union Oil Co. 61-12 G & L, 12-3s-10w, dry, TD 5,138 ft., elev. 455 ft.

East Coyote area: Universal Consolidated Oil Co. 101 Tuffree, 19-3s-9w, dry, TD 5,496 ft., elev. 351 ft.

San Luis Obispo County, Taylor Canyon area: Universal Consolidated Oil Co. 55A-31 Humble, 31-32s-20e, dry, TD 2,470 ft., elev. 3,550 ft.

Solano County, west Rio Vista area: D. D. Feldman 1 Natural Gas Corp. Robbins, 19-3n-2e, dry, Markley 2,820 ft., Domengine 6,540 ft., TD 7,010 ft., elev. 60 ft.

Ventura County, Santa Paula area: Union Oil Co. X-3 Ex-Mission Fee, proj., 10-3n-22w, dry, TD 7,210 ft., elev. unreported.

CALIFORNIA SUCCESSFUL WILDCATS

Kern County, Arvin area, new field discovery 1 mile southeast of Mountain View field: The Texas Co. 1 George, NE NW 23-31s-29e, flowed 32 -gravity crude at rate of 576 bbl. daily, cut 25 per cent, 151 ft. of perforations above 6,514 ft. in Santa Margarita sand (upper Miocene), ⅛-in. bean, TD 6,516 ft., elev. 473 ft.

West Edison area, new Chanac sand fault-block pool: California Exploration Co. and Macmillan Petroleum Co. 27-1 "Well," SW SW 27-30s-29e, flowed and pumped 175 bbl. daily through 13/64-in bean, 22.5°-gravity cut 5 per cent, perf. 4,032-4,310 ft., Chanac sand 4,030 ft., Santa Margarita 4,385 ft., TD 4,750 ft., plugged back to 4,320 ft., elev. 450 ft.

Monterey County, ½-mile southeast extension to San Ardo field: Jergins Oil Co. 116-18 Hambey, SW NW 18-23s-11e, pumped 70 bbl. daily 11°-gravity crude from 30 ft. of perforations above 2,205 ft., Lombardi 2,115 ft., Orradre 2,434 ft., basement 2,695 ft., TD 2,717 ft., plugged back to 2,205 ft., elev. 625 ft.

Ventura County, ½-mile east extension to Ventura Avenue field: Lloyd Corp., Ltd., 1 William Sexton, projected 20-3n-22w, pumped 46 bbl. daily through perforations at 12,645-12,850 ft., TD 13,058 ft., plugged back to 12,890 ft., elev. 1,210 ft.

Eastern Texas

Wood County Sub-Clarksville Discovery Drilling Ahead

DALLAS—A. O. Phillips and others 1 D. E. Dobbs, wildcat south of Pine Mills and west of the field of the same name, found water in the Woodbine sand around 6,500 ft. and was drilling ahead to the Georgetown.

The well had previously indicated production from a 30-ft. section in the sub-Clarksville and will be completed from that zone if the lower formations are dry.

In Navarro County, 10 miles south of Kerens, Brown & Wheeler 1 Henderson was running a drill-stem test after coring slightly porous limestone with faint gas odor from 6,918-68 ft. The section was identified as the lower Pettit, topped at 6,865 ft.

The Texas Co. 1 Hanks, Anderson County gas-distillate discovery west of Fosterville, recovered 3,500 ft. of gas and distillate-cut water cushion, plus 75 ft. of distillate on a 50-minute drill-stem test in the James limestone from 10,092-104 ft. Gas and water cushion reached the surface in 50 minutes. It was to be drilled ahead on a Travis Peak contract.

Mid-Continent Petroleum Corp. has staked location for an extension test in the Sandusky area of Grayson County as the 1 Susie Martin, I. B. Walker Survey, 1¼ miles southwest of present Oil Creek production. Contract depth was 8,000 ft.

South of the Sandusky townsite, Kay Kimbell 1 Reast was drilling shale and lime at 6,635 ft. Same operator's 1 E. R. Miller, T. M. Bruce Survey, was drilling below 6,210 ft.

Mid-Continent and Skelly Oil Co. 1-D Chiles, deep test for the area, was drilling sand and shale at 8,558 ft. George Hum-

phrey 1 Barnes Heirs, southwest of Hagerman, was in lime and shale at 9,638 ft.

EAST TEXAS (DISTRICTS 5 AND 6) SUCCESSFUL WILDCAT

Wood County: W. W. Wise 1 Lillian Mosely, W. H. Secrest Sur., 1½ mi. SW Midway Lake, TD 4,587 ft., sub-Clarksville 4,557-87 ft., IP pumped 67 bbl. 19°-gravity oil a day.

EAST TEXAS (DISTRICTS 5 AND 6) WILDCAT FAILURES

Freestone County: Humble Oil & Refining Co. 1 Mattie McAdams, M. Autrey Sur., dry, TD 9,645 ft., Woodbine 4,778 ft., Goodland 6,045 ft., Paluxy 6,395 ft., Travis Peak 9,065 ft.

McLennan County: A. C. Behr 1 Elizabeth Williams, D. Faulkner Sur., dry, TD 453 ft.

Morris County: W. M. Coats 1 Reese, P. Bland Sur., dry, TD 7,110 ft., Woodbine 3,760 ft., Paluxy 4,707 ft., Rodessa 6,458 ft., Pettit 6,875 ft., Travis Peak 6,962 ft.

Navarro County: Coffield & Guthrie 5 A. M. Kelly, M. Autrey Sur., dry, TD 3,013 ft.

Wood County: Hollandsworth Oil Co. 1 Westgate-Greeland, J. B. Tucker Sur., dry, TD 6,100 ft., elev. 476 ft., sub-Clarksville 5,005 ft.

Vernon Whiteley Drilling Co. 1 T. B. Crump, S. Hatfield Sur., dry, TD 4,791 ft., sub-Clarksville 3,972 ft.

Canadian Fields

Kavanagh Area Gets Gas Strike

AMERICAN NORTHLAND OIL CO. and associates have completed their exploratory well in the Kavanagh area as a Lower Cretaceous gas well. The well, American Northland et al-S. E. Leduc 1-5-1, is in LSD 5, 1-49-25w4, about 3 miles east and ½ mile south of Locksley Kavanagh 1, D2 Devonian oil discovery. Gas was encountered in the Cretaceous during drilling operations. The hole was carried to final total depth of 5,562 ft. without finding encouragement in the Devonian. It was then plugged back to 4,480 ft. and 7-in. casing was set at 4,521 ft. using 220 sacks. Two tests were run at the well before it was capped pending a market for its product. During the test at 4,437-49 ft., it had gas at a 2,000,000-cu. ft. daily rate, and a test from 4,448-62 ft. flowed 3,100,000 cu. ft. of gas per day.

Interest in the well and acreage involved will be divided 50 per cent to American Northland Oil Co., and 25 per cent to Cardinal Oils, Ltd., of Vancouver and an undisclosed San Francisco firm. The Cardinal-San Francisco group paid 55 per cent of drilling costs. The acreage covers all of 1-49-25w4, except the southeast corner. Outstanding royalty in the acreage varies from 16⅔ to 25 per cent gross.

On the Stony Plain Indian Reserve, north of Leduc field, basal Cretaceous sand made news at two wells on a quarter section offsetting Royalite-Stony Plain 2, D3 oil well. Royalite-Devon Leduc-Stony Plain 4-23, ⅜ mile southwest of the D3 producer, has found gas and some oil in the Cretaceous. A 1-hour drill-stem test of interval 4,305-19 ft. brought wet gas to surface in 4 minutes at a daily rate of 400,000 cu. ft., decreasing to 200,000 cu. ft. Pipe recovery was 380 ft. of clean oil and 180 ft. of oil-cut mud. The next test, at 4,320-25 ft., gave gas to surface in 6 minutes at the rate of 180,000 cu. ft., decreasing to 90,000 cu. ft. Pipe recovery in 1 hour was 150 ft. of oil. The last test, of interval 4,325-30 ft., had gas at the surface (200,000 cu. ft. daily) during the 1 hour that the tool was open. Pipe recovery was 2,625 ft. of fluid, consisting of 200 ft. of clean oil, 225 ft. of oil-cut mud, and 2,200 ft. of drilling mud. Operators are now drilling below 4,368 ft.

Royalite-Pan Western 10-23, completing in Cretaceous, ⅜ mile northeast of the Royalite group D3 oil well, is now swabbing oil after opening up the pay sand. The swab rate is 10 bbl. of oil per hour.

Imperial Oil, Ltd., is preparing location for a wildcat in the far northwest reaches of Alberta, around 335 miles northwest of Edmonton. The venture is Imperial Surette Lake 1, in LSD 15, 24-109-17w5. Imperial will use one of its own rigs to drill the well, probably a deep test, down to and including the Devonian formations. The test is located about 16 miles southeast of Imperial Crossroads 1, dry hole, and about 35 miles southeast of the nonproductive Shell Watt Mountain strat test, the most northerly well yet drilled in Alberta. The closest settlement, Fort Vermilion, is situated about 25 miles southeast of the new wildcat.

Barons-Monarch Oils 1, ½ mile due east of Barons Oil, Ltd., 1 oil discovery, looks as though it will rate a fair initial potential on pump, to give the Barons area its second well after a string of five step-out failures. Barons is located in Southwest Alberta, around 80 miles southeast of Calgary, in LSD 12, 14-12-23w4. It started swabbing early in the week, clearing out input water and mud at a rate of 5 to 6 bbl. hourly. By the end of a day's swabbing, some oil was being recovered. On later swab runs, the well was officially reported to be making clean crude oil of about 34.5° gravity, at a rate of 5 bbl. per hour. Data on fluid level was not given. The crew is now preparing to install pumping equipment, and the well is expected to commence steady production on pump in a few days. The venture encountered about 22 in. of well-developed sand in stringers between 4,067-4,117 ft. Casing was set through the zone to bottom (4,117 ft.) and was perforated for production.

CANADIAN SUCCESSFUL WILDCATS

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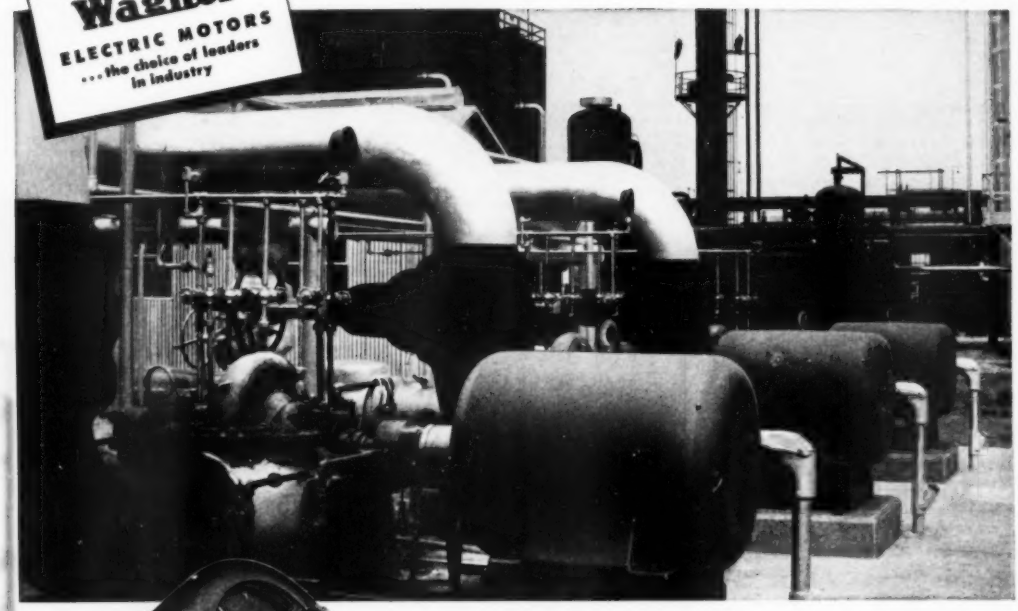

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5, 1 49-25w4, TD 5,562 ft., capped gas well.
Texaco Majeau Lake 2, LSD 3, 25-56-4w5, TD 5,417 ft., capped gas well.
Sun-Albercan-Royalite-Sibbald 2, LSD 10, 31-27-2w4, TD 3,255 ft., capped gas well.

CANADIAN WILDCAT FAILURES

Delhi Socony Farrel Lake 1, LSD 1, 19-33-17w4, TD 5,220 ft.
Canadian Delhi Jenner 1, LSD 11, 17-19-9w4, TD 3,383 ft.
Western Dome Socony Border 19-3, LSD 3, 19-1-18w4, TD 3,983 ft.
British Dominion Central Del Rio Scotfield 1, LSD 1, 2-29-11w4, TD 3,925 ft.

Rocky Mountain

Shell's Montana Wildcat Tests 80-100 Bbl. Initial

DENVER.—Initial tests on Shell Oil Corp.'s Richey, Montana, wildcat have recovered 80 to 100 bbl. of oil daily. However, no conclusive tests have been made on the well, and the flow rate through 1-in. choke dropped rapidly over 4-hour tests.

Shell has not released testing data on the wildcat, but has stated that "Initial-production tests . . . have demonstrated that the well is capable of producing substantial quantities of 38°-gravity oil." The company is moving in drill pipe to deepen the well, and will probably deepen at 10-ft. intervals and test, and possibly acidize the limestone producing zone. Seven-inch casing was cemented at 7,183 ft. on top of the basal Mississippian (?) producing zone, and the present total depth is 7,266 ft.

Unofficial reports of gages indicated a production of 344 bbl. of oil on a total of 8½ hours testing the first day. The well is 1 Northern Pacific, SE NW NW 19-23n-50e, Dawson County, the second well to find production in the Williston basin.

Approximately 135 miles northeast of Richey, Amerada Petroleum Corp. this week completed the first commercial producer in this basin. The well is 1 Clarence Iverson, C SW SW 6-155n-95w, in the Beaver Lodge area, Williams County, North Dakota. Amerada completed the well for a flow of 12 bbl. of oil per hour with 290,000 cu. ft. of gas daily. Production is from the zone 10,490-10,530 ft., where casing was perforated with 4 shots per foot. The zone was acidized with 3,000 gal. prior to completion.

This well flowed 307 bbl. of oil in 17 hours from the zone 11,630-60 ft. and had additional shows down to the 11,955-ft. total depth. Amerada made location for a second well in the field, 1½ miles northeast of the discovery. Amerada is also drilling two new wildcats, one south and another northwest of Beaver Lodge, along the long Nesson anticline.

Activities in Montana and North Dakota have detracted from new discoveries in other areas of the mountain states. Thomas Doswell's Tocito sand (?) discovery at South Largo, C NW SE 9-26n-6w, Rio Arriba County, New Mexico, flowed 720 bbl. of oil in 24 hours through ¼-in. choke, and testing is continuing. Pressures were high on the well and gas-oil ratio was 585:1.

In Wyoming, General Petroleum Corp.'s Manderson Phosphoria discovery in Big Horn County flowed 37 bbl. of oil per hour through 11/64-in. choke. The oil is 41°-gravity, and gas-oil ratio is 2,600:1. Phosphoria was topped at 7,220 ft. with total depth at 7,303 ft.

Continental Oil Co. tested oil from the Shannon at the 1 Unit, NW SE NW 8-42n-79w, West Sussex area, Johnson County. On test from 2,875-95 ft., tool open 1 hour, the recovery was 270 ft. of oil and 180 ft. of oil and gas-cut mud. The operator is now testing after coring additional saturation.

P. T. Sharples, head of Sharples Oil Corp., Denver, tested the Southeast Meadow Creek, NE SE NW 19-41n-77w, wildcat at the rate of 375 bbl. of oil in 24 hours through 24/64-in. choke. The well flowed 200 bbl. daily through 16/64-in. choke from the Lakota sand.

Mountain Fuel Supply Co. is drilling water well for a wildcat at Grizzley Butte, NE SE SW 35-15n-113w, south of the Church Buttes field in Uinta County, Wyoming.

WYOMING WILDCAT FAILURE

South Elk Basin, Park County: Continental Oil Co. 7 Ida Goodstein, NE SE NW 20-57n-99w, TD 7,515 ft., PB 6,670 ft., temporarily abandoned, first Frontier 3,941 ft., second Frontier 4,292 ft., Muddy 5,054 ft., Dakota 5,277 ft., Morrison 5,420 ft., Sundance 5,845 ft., Chugwater 6,333 ft., Dinwoody 6,801 ft., Phosphoria 6,830 ft., Tensleep 6,862 ft., Amsden 7,067 ft., Madison 7,284 ft.

COLORADO WILDCAT FAILURES

Northeast Armstrong, Logan County: Derby Oil Co. et al 1 Johnson, SE SE NW 20-12n-52w, TD 5,610 ft., abandoned, Niobrara 4,286 ft., Ft. Hays 4,610 ft., Greenhorn 4,822 ft., "D" sand 5,085-5,132 ft., "J" sand 5,206-78 ft., Lakota 5,458 ft., Morrison 5,580 ft.

Yeter area, Logan County: Pennant Drilling Co. 1 Frau, SW SW SW 35-9n-54w, TD 5,200 ft., abandoned, Niobrara 4,242 ft., Ft. Hays 4,552 ft., Greenhorn 4,803 ft., "D" sand 5,063 ft., "J" sand 5,173 ft.

Washington County: Skelly Oil Co. 1 C. J. Hottinger, SW NE NE 23-4n-52w, TD

NEW DAKOTA MAPS

State maps showing sections, townships, ranges, county seats, oil wells, gas wells, dry holes with elevations, total depths and name of company who drilled test.

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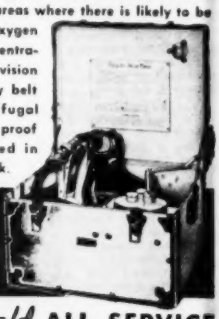

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5,557 ft., abandoned. Niobrara 3,795 ft., Ft. Hays 4,111 ft., Greenhorn 4,325 ft., "D" sand 4,582 ft., "J" sand 4,659 ft., Lakota 4,894 ft., anhydrite 5,348 ft.

WESTERN NEBRASKA WILDCAT FAILURES

Box Butte County: Sinclair Oil & Gas Co. 1 Cook, NW NW SW 31-25n-51w, TD 4,582 ft., dry. Niobrara 2,924 ft., Ft. Hays 2,167 ft., Greenhorn 3,488 ft., Muddy 3,959 ft., Dakota 4,164 ft., Morrison 4,358 ft., Sundance 4,445 ft., Triassic 4,563 ft.

Perkins County: Ohio Oil Co. 1 Sejkora, NW NW SE 23-10n-39w, TD 5,218 ft., dry, Greenhorn 2,561 ft., first Dakota 2,694 ft., Morrison 3,432 ft., Granite 5,210 ft.

Sheridan County: Superior Oil Co. 1 Sandoz, NE SE SW 18-28n-42w, TD 2,815 ft., dry.

North Central Texas

Throckmorton County Test Slated for Dual Completion

WICHITA FALLS.—Warren Oil Corp. 1 G. Williams, Throckmorton County Caddo discovery southeast of Woodson, found oil in the Mississippian and has been scheduled for dual completion.

Top of the Mississippian was 4,368 ft. Operators drilled 10 ft. into the limestone and ran a 2-hour, drill-stem test which had flowing oil at the surface at the end of that time. Recovery was only 20 ft. of oil, as the well unloaded all the way out.

Previously the well had Caddo production between 3,556-90 ft.

Southern Throckmorton County received a small Strawn discovery. R-G Drilling Co. 2 N. L. B. Davis, 8 miles south of Throckmorton, completed on the pump for 47 bbl. of oil a day from pay at 3,431-38 ft.

T. V. Gorman completed 1 F. L. Kelly as a Strawn discovery in Block 158, TE&L Survey, in the Olney townsite. The well made a pumping potential of 120 bbl. of oil a day from pay at 3,038-43 ft.

In Jones County, The Texas Co. 1 F. J. McDonald, 15 miles southwest of Anson, was testing on perforations from 3,940-54 ft. Swabbing produced 51 bbl. of oil with some mud in 3 hours. A later test developed salt water along with the oil and perforations were squeezed. New shots were to be placed near the same interval in an effort to shut off water.

American Republics and Magnolia Petroleum Co. 1 Smith, Fisher County Ellenburger prospect 5 miles west of Longworth, found the water table in testing from 6,680-6,735 ft. Drill-stem test at that interval developed 150 ft. of sulfur water cut with gas and mud and 460 ft. of sulfur water.

The well had top of the formation at 6,590 ft., by samples. A test from 6,569-6,630 ft. recovered 180 ft. of gas and 130 ft. of heavily oil and gas-cut mud. A 90-minute test between 6,599-6,640 ft. recovered 90 ft. of heavily oil and gas-cut mud.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) SUCCESSFUL WILDCATS

Archer County: Milton Fish 1 D. W. Fish, Block 84, Harris Subd., Club Ranch, 6 mi. SW Archer City, TD 1,388 ft., pay 1,382 ft., IP pumped 50 bbl. 42°-gravity oil a day.

Jack County: Franklin Love & Co. 1 E. M. Williams, Sec. 3, BS&F Sur., 9 mi. SW Jacksboro, TD 4,850 ft., pay 4,844 ft., IP flowed 177 bbl. oil a day, ¼-in. choke, GOR 475:1.

Jones County: West Central Drilling Co. 1 W. F. Eumpass, Black 262, G. B. Blackburn Sur., 1½ mi. W Truby, TD 4,545 ft., elev. 1,757 ft., Strawn sand 4,493 ft., IP flowed 136 bbl. 41°-gravity oil a day, ¼-in. choke, TP 175 psi., GOR 450:1.

Palo Pinto County: Palo Pinto Oil & Gas Corp. 2 F. J. Berger, 54-2-T&P, 11 mi. N Strawn, TD 3,893 ft., elev. 1,194 ft., perf. 3,885-90 ft., IP flowed 400 bbl. 43°-gravity oil a day, 21/64-in. choke, TP 675 psi., GOR 3,850:1.

Stephens County: Kingery Producing Co. 1 J. D. Gray, 18-6-T&P, 13 mi. SE Breckenridge, TD 2,168 ft., pay 1,840-49 ft., IP pumped 16 bbl. 42°-gravity oil a day.

Young County: E. B. Russell 1 T. E. Loran, TE&L Sur. 262, 2 mi. N Newcastle, TD 4,775 ft., elev. 1,217 ft., pay 4,765 ft., IP flowed 864 bbl. 42°-gravity oil a day, TP 400 psi., GOR 400:1.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: Bridwell Oil Co. 1 Berend, Lot 50, Block 3, Clark & Plumb, dry, TD 4,735 ft.

Bridwell 1 J. K. Coleman, Block 58, A. Castlberry Sur., dry, TD 5,650 ft.

P. P. Langford 1 P. P. Langford, Block 148, John W. Harris Subd., dry, TD 1,441 ft.

R. Clay Underwood 2 J. R. Parkey, Sec. 1, SPRR Sur., dry, TD 1,817 ft.

Baylor County: E. B. Clark 1 C. H. Taylor, 9-A239-H&TC, dry, TD 5,351 ft., Caddo 5,236 ft.

Brown County: Capital Co. 1 E. F. George, Block 16, M. P. Jones Sur., dry, TD 2,406 ft., Caddo 1,685 ft.

P. F. Lawlis 1 Ray Dodds, A. Candler Sur., dry, TD 2,456 ft., Ellenburger 1,840 ft.

Clay County: Frank Wood 1 Lone Star Producing Co., Block 28, Parker CSL, dry, TD 240 ft.

Coleman County: Gilchrist Drilling Co. 1 Taylor Estate, Sec. 671, Charles Smith Sur., dry, TD 2,805 ft.

Horace White 1 J. C. Fuller, Jr., 656-25-H. Crocheron Sur., dry, TD 1,962 ft.

Cooke County: Russell & Russell 1 Eppie Inglish, G. W. McGowan Sur. 695, dry, TD 1,802 ft.

Cottle County: Humble Oil & Refining Co. 2 Matador Land & Cattle Co., Sec. 47, J. H. Stephens Sur., dry, TD 6,125 ft., Wolfcamp 3,060 ft.

Eastland County: Tobe Foster 1 F. D. Wright, 45-3-H&TC, dry, TD 3,722 ft., elev. 1,651 ft., Caddo 3,163 ft.

S. D. Johnson 1 W. J. Matthews, 23-4-H&TC, dry, TD 3,665 ft., elev. 1,518 ft., Caddo 3,098 ft.

Fisher County: Moutray Moore Drilling Co. 1 G. W. Leonard, 91-1-H&TC, dry, TD 4,024 ft., elev. 1,492 ft., Flippen 3,352 ft., Swastika 3,978 ft.

Sojourner Drilling Co. 1 W. R. Hudspeth, Block 23, E. Miley Sur. 219, dry, TD 5,612 ft., elev. 1,837 ft., Ellenburger 5,574 ft.

Hardeman County: Jewell Kimberlin 1 E. F. Norton, Sec. 2, Wheeler CSL, dry, TD 6,005 ft.

Haskell County: Stanolind Oil & Gas Co. 1-A W. H. Haynes, James Joslin Sur. 160, dry, TD 3,595 ft.

Jack County: Harper Petroleum Co. 1 Woodhouse, Sec. 2,018, TE&L Sur., dry, TD 2,194 ft.

Russell Maguire 1 McDowell, J. Gates Sur., A-236, dry, TD 4,950 ft.

Rogers Bros. 1 Mrs. W. R. Dearing, TE&L Sur., A-709, dry, TD 4,496 ft., Caddo 4,448 ft.

Paul P. Steed 1 R. O. Pogue, R. R. Stanton Sur., dry, TD 4,012 ft.

Jones County: Grisham-Hunter Corp. 1-C J. J. Steele, 40-334-Harrison CSL, dry, TD 3,048 ft.

C. L. McMahon, Inc., 1 L. D. Hopper, Sec. 23, E. A. Buie Sur., dry, TD 4,767 ft., elev. 1,825 ft., Flippen 2,490 ft.

W. A. Moncrief 1 A. B. Faulks, Sec. 10, H. Millard Sur. 243, dry, TD 1,989 ft.

C. B. Schwartz 1 M. J. Merchant, Block 264, A. Glenn Sur., dry, TD 4,710 ft., elev. 1,715 ft., Palo Pinto 4,210 ft., Strawn 4,610 ft.

Stephens Petroleum Co. 1 Whittemore, 64-1-BBB&C, dry, TD 4,000 ft., elev. 1,638 ft., Canyon sand 3,835 ft.

Montague County: D. H. Bolin 1 E. J. Bouldin, E. Votaw Sur., A-827, dry, TD 3,500 ft.

D. L. Myers 2 J. E. Martin, E. Votaw Sur., A-27, dry, TD 2,952 ft.

Palo Pinto County: W. P. Luse 1 J. F. Mitchell, Lot 38, League 2, Burleson CSL, dry, TD 3,520 ft., conglomerate 3,422 ft.

Shackelford County: Harry Beaumont 1 J. H. Elliott, Sec. 22, BOH Sur., dry, TD 4,305 ft., elev. 1,294 ft., Caddo 3,715 ft.

Big West Drilling Co. 2 J. H. Nail 13, Sec. 67, TEFR Sur., dry, TD 1,330 ft.

Stephens County: E. C. Johnson Co. 1 Mary Edith Marrs, 89-6-T&P, dry, TD 2,161 ft.

Panhandle Producing & Refining Co. 1 Ed Ford, 2-1-SPRR, dry, TD 4,753 ft., elev. 1,134 ft., Caddo 3,400 ft., Mississippian 4,718 ft.

Taylor County: P. P. Steed 1 Earl Schultz, 50-19-T&P, dry, TD 2,573 ft.

Wichita County: E. R. and C. W. Schoeder 1 W. C. Probst, George G. Marion Sur., dry, TD 1,800 ft.

Young County: J. W. Hastings 2 Prideaux, S. Tynes Sur., dry, TD 3,532 ft.

E. R. Remmington 2-A C. J. Taack, TE&L Sur. 248, dry, TD 680 ft.

St. John Drilling Co. 1 Thomas, TE&L Premium Sur., Block 155, dry, TD 4,003 ft.

Appalachian-Ohio

Chert Gasser Completed in Garrett County Maryland

PITTSBURGH.—In Garrett County, Maryland, Eberly & Johnson completed 1 William White, gaging 2,800,000 cu. ft. of gas in chert after shot. Eberly & Snee 1 Eli Beechie, elevation 2,439 ft., reached the Onondaga at 3,993 ft. and is running casing at that depth.

In Holley district, Webster County, West Virginia, United Fuel Gas Co. located 1-6751 Henry A. Brockerhoff, elevation 1,420 ft., Sutton Quadrangle, 4.9 miles south of Lat. 38° 40′ and 1.05 miles west of Long. 80° 30′.

In Portland district, Preston County, Hope Natural Gas Co. located 9665 J. Paul Martin, elevation 2,308 ft., Kingwood Quadrangle, 5.1 miles south of Lat. 39° 30′ and 3.95 miles west of Long. 39° 30′.

In Teays Valley district, Putnam County, C. D. Raines completed 3 L. K. Ervin, gaging 1,500,000 cu. ft gas in the Big Injun sand at a total depth of 1,598 ft.

In Napier Township, Bedford County, southwestern Pennsylvania, South Penn et al have recovered the tools in 1 Jesse B. Miller and are now cleaning out. The depth of the hole is 8,878 ft.

MARYLAND SUCCESSFUL WILDCAT

Garrett County: Eberly & Johnson 1 William White, elevation 2,412 ft., 2,800,000 cu. ft. gas, chert 3,627 ft., gas 3,647-74 ft., Oriskany sand 3,748 ft., TD 3,864 ft.

OHIO

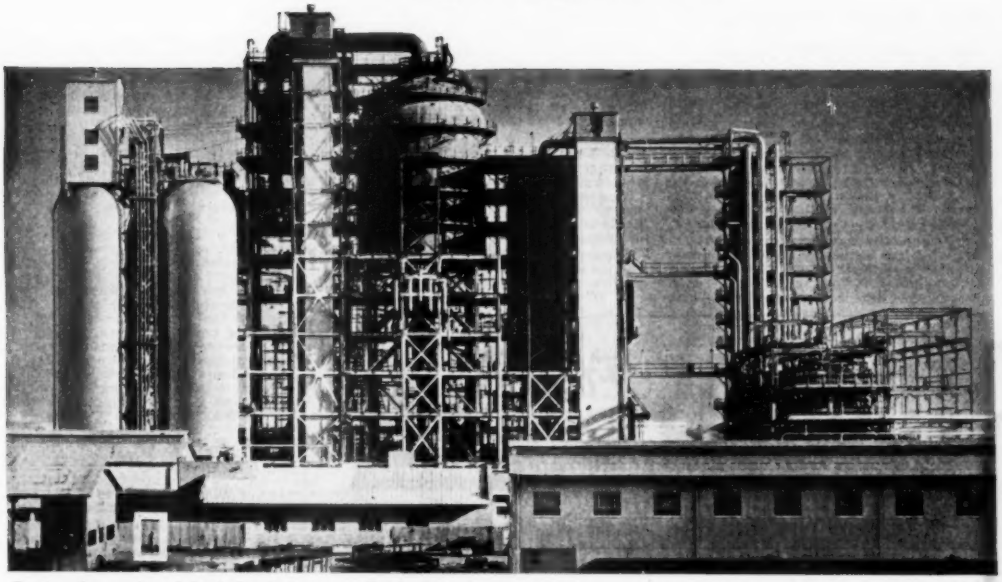
COLUMBUS.—E. C. McManaway et al., found 110,000 cu. ft. of gas in a rank wildcat in Troy Township, Richland County. The discovery is located on the K. J. Cockley tract in Section 13, north of the town of Lexington and 8 miles west of the main field. Five feet of broken Clinton sand was found and the operators expect to drill additional wells in hopes of finding better sand.

J. A. Upham 1 I. D. Strahn, Section 21, Warren Township, Tuscarawas County, logged red and white Clinton sands at 5,126-80 ft. with an open flow of 560,000 cu. ft. of gas. The well was tubed, natural, and rocked to 1,350 psi.

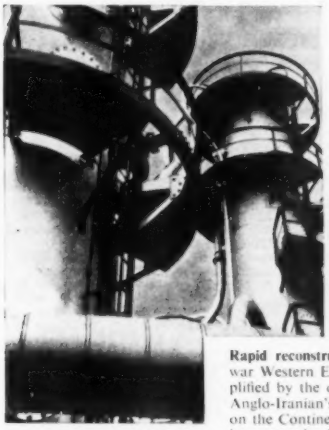
Ohio Fuel Gas Co. 2 W. A. Spitzer, Lot 40, Litchfield Township, Medina County, drilled through the Clinton at 2,809-20 ft. with an open flow of 2,000,000 cu. ft. of gas, natural.

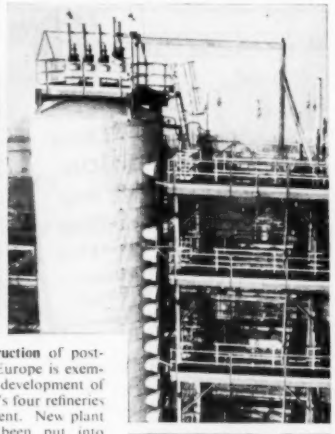
Waverly Oil Works 4 Mary J. Fleming, Lot 13, Hanover Township, Licking County, logged the Clinton at 2,811-36 ft. with gas in the tcp and a good showing of oil in the bottom. After shot, the producer made 43 bbl. of oil in 24 hours with 300,000 cu. ft. of gas.

Refinery Expansion

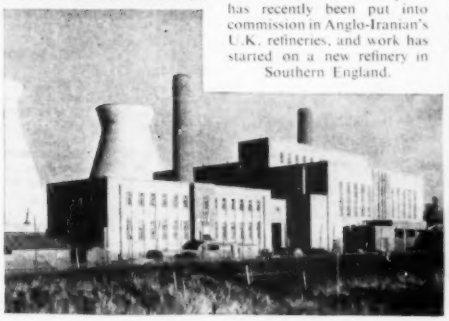


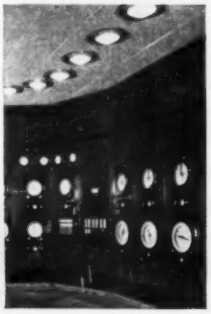
Continued expansion of Anglo-Iranian's many refineries in various countries accounts for steadily increasing throughput and higher quality of finished products. The size of the huge new catalytic cracking plant shown above can be judged from the figure of the man outlined on the lower left.





Rapid reconstruction of post-war Western Europe is exemplified by the development of Anglo-Iranian's four refineries on the Continent. New plant has recently been put into commission in Anglo-Iranian's U.K. refineries, and work has started on a new refinery in Southern England.





Oil Producers and Refiners

in the Middle East since 1912, Anglo-Iranian Oil Company and its associated companies also operate eleven refineries in the United Kingdom, France, Germany, Italy, Israel, Irak, Kuwait and Australia. Their sales organization includes major marketing or supply interests in Europe, Asia, Africa and Australasia, with international ship's bunkering and aviation services.

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Permian Basin

Tide Water's 1 Dickenson Test Shows in Ellenburger

MIDLAND.—Following closely on completion of Pan American Production Co. 1 Breedlove in northwestern Martin County as a flush Devonian strike, the spotlight this week turned south to Tide Water Associated Oil Co. 1 E. B. Dickenson in 44-37-T1N-T&P. At week's end the Dickenson test looked as though it would make a substantial Ellenburger well. Previously it had showed for production in the Devonian.

A 3-hour drill-stem test from 12,090-12,115 ft. had gas at the surface in 45 minutes and recovered 2,435 ft. of 51°-gravity oil with no water. According to some reports the tool may have been plugged for a part of the testing time. On elevation of 2,745 ft., tentative top of the Ellenburger was placed at 12,090 ft.

Sinclair Oil & Gas Co. prepared to drill-stem test at 1 June Tippett, Ellenburger test and east offset to the Pennsylvanian discovery of the Wofford Cain field in southern Midland County northeast of the Peck field. Top of the lower formation had not been placed at last report, but a core identified as Ellenburger between 13,108-43 ft. recovered 35 ft. of hard dolomite with some fractures, porosity, and oil stains.

Magnolia Petroleum Co. 1 Tom Peay, Andrews County deep wildcat, topped the Ellenburger at 13,998 ft., elevation 3,160 ft., and drilled ahead to 14,033 ft. where a drill-stem test was made. The well previously made a flow of oil from the lower Permian and recovered some oil in the Pennsylvanian.

Magnolia 1 Gertrude Chilton, Gaines County wildcat 13 miles southwest of Mungerville, swabbed and flowed 145 bbl. of new oil in 12 hours, from perforations in a Pennsylvanian reef at 11,354-75 ft. The test followed 500-gal. acid treatment. Testing was to continue. Top of the reef was placed at 11,323 ft., and top of the Mississippian at 11,820 ft. Total depth was 12,437 ft.

In Midland County, west of the Midkiff Spraberry field, Los Nietos Oil Co. 1 Youngblood was reported dry at 8,280 ft. The well had made extensive tests of the Spraberry and had set whipstock in first hole and redrilled the section in an effort to make a producer.

Sinclair 1 McElroy Ranch, northeast offset and third producer for the new Wilshire Ellenburger field in Upton County, finaled for a daily potential of 2,584 bbl. of 53°-gravity oil a day. The test was through open tubing from perforations at 12,365-13,465 ft.

Sinclair 3 McElroy Ranch, south of the above well, established production in the Pennsylvanian from 9,416-45 ft., then prepared to drill ahead to the Ellenburger. On drill-stem test, the well flowed 61 bbl. of oil in 3 hours. The same section is producing at the original discovery.

In Pecos County, Gulf Oil Corp. 1 Winfield was reported reaming at 14,088 ft. Work had been held up by a fishing job.

In Yoakum County, Continental Oil Co. 1 Pierson was conditioning hole at 12,325 ft. The same firm's 1 Rodgers was drilling lime and shale at 11,526 ft. General American Oil Co. 1 W. J. Richardson was drilling limestone at 11,887 gt., and G. E. Hall 1 Jenkins was changing rigs at 8,950 ft., total depth.

WEST TEXAS (DISTRICTS 8 AND 7-C) SUCCESSFUL WILDCATS

Andrews County: Sinclair Oil & Gas Co. 1 R. A. Cox, 8-A30-PSL, TD 7,600 ft., elev. 3,470 ft., Wichita Albany 7,250 ft., perforated 7,445-95 ft., IP pumped 138 bbl. 42°-gravity oil a day.

Crockett County: Continental Oil Co. 1-A Shannon, 22-UV-GC&SF, TD 7,236 ft., elev. 2,695 ft., Ellenburger 6,949 ft., pay 7,185 ft., IP flowed 2,581 bbl. 39°-gravity oil a day, ½-in. choke, GOR 659:1, TP 600 psi.

Midland County: C. W. Murchison 2 Canon, 13-4-4S-T&P, TD 10,551 ft., elev. 2,887 ft., perf. Pennsylvanian 10,468-98 ft., IP flowed 839 bbl. 44°-gravity oil a day, 14/64-in. choke, GOR 1,660:1, TP 280 psi.

Sinclair Oil & Gas Co. 7 June Sanders, Tract C, 2 mi. N Peck field, 9-41-4S-T&P, TD 13,340 ft., elev. 2,904 ft., Ellenburger 13,250 ft., IP pumped 38.5 bbl. 53°-gravity oil a day, GOR 1,650:1.

Sohio Petroleum Co. 1 H. T. Boone, 42-36-2S-T&P, TD 7,140 ft., elev. 2,618 ft., Spraberry 7,038 ft., IP flowed 357 bbl. 39°-gravity oil a day, ¾-in. choke, GOR 500:1, TP 80 psi.

Sohio 1-A D. L. Hutt, 18-37-4S-T&P, TD 7,323 ft., elev. 2,753 ft., Spraberry 7,228 ft., IP flowed 245 bbl. 39°-gravity oil a day, 16/64-in. choke, GOR 500:1, TP 115 psi.

Reagan County: Sunray Oil Corp. 1-8-A Sherrod, 8-C-L&SV, TD 7,013 ft., elev. 2,702 ft., Spraberry 6,910 ft., IP pumped 141 bbl. 35°-gravity oil a day, GOR 368:1.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Cottle County: Signal Oil & Gas Co. 1 Swanson, 28-B-J. H. Stephens Sur., dry, TD 5,601 ft., elev. 2,087 ft., Hickory 5,505 ft., pre-Cambrian 5,599 ft.

Crockett County: J. L. Greer 1 Shannon, 37-UV-G&SF, dry, TD 2,036 ft.

Crosby County: Tide Water Associated Oil Co. 1 Hickman, 8½-M-AB&M Sur., dry, TD 8,773 ft., elev. 3,023 ft., Pennsylvanian 5,936 ft., reef 8,084 ft., Mississippian 8,422 ft.

Dawson County: James H. Snowden 1-29 Carrie S. Dean, 29-1-J. Poitevant Sur., dry, TD 7,530 ft., elev. 2,821 ft., Spraberry 6,474 ft.

Dickens County: Headwaters Oil Co. 1 Pitchfork Land & Cattle Co., 13-D-T. A. Thompson Sur., dry, TD 6,808 ft., elev. 1,983 ft., Canyon 5,295 ft., Barnett 6,580 ft., Chappell 6,644 ft.

Ector County: Stanolind Oil & Gas Co. 1-A Earl Vest, 7-B-15-PSL, dry, TD 10,885 ft., elev. 2,906 ft., Pennsylvanian 7,650

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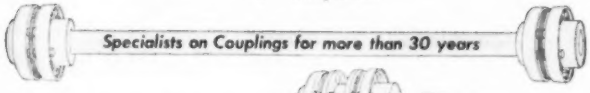

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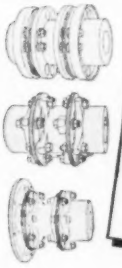

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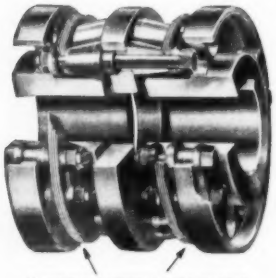

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ft., Mississippian 7,940 ft., Devonian 8,560 ft., Ellenburger 10,850 ft.

Gaines County: Amerada Petroleum Corp. 1-A San Salvador, 4-G-C&M Sur., dry, TD 9,249 ft., elev. 3,184 ft., Spraberry 7,10 ft., reef 9,007 ft.

Hale County: Honolulu Oil Corp. 1 Charles Clements, 19-D7-EL&RR, dry, TD 10,-162 ft., elev. 3,349 ft., Strawn 8,630 ft., Mississippian 9,395 ft.

Howard County: Southern Minerals Corp. 1 F. W. Weaver, 23-30-1N-T&P, dry, TD 8,162 ft., elev. 2,330 ft., Wolfcamp 5,770 ft., reef 8,050 ft.

Irion County: Wilshire Oil Co. 1 B. F. Phillips-M. L. Beam, 14-3-H&TC, dry, TD 7,534 ft., elev. 2,329 ft., Strawn 7,112 ft., Ellenburger 7,216 ft.

Martin County: Pentex Oil Corp. 1 Ruby Ragland, 2-35-1S-T&P, dry, TD 7,542 ft., elev. 2,534 ft., Spraberry 6,637 ft.

Wood River Oil & Refining Co. 1 McClain, 38-36-2N-T&P, dry, TD 8,115 ft., elev. 2,724 ft., Spraberry 7,195 ft.

Pecos County: Hunt Oil Co. 31 Elsinore Royalty Co., 87-D-GC&SF, dry, TD 1,150 ft.

Reeves County: Buffalo Oil Co. O. D. Smith, 3-C20-PSL, dry, TD 3,532 ft., elev. 2,795 ft., Delaware sand 3,396 ft.

Miami Operating Co. 1 Balmorhea Ranches, 84-13-H&GN, dry, TD 12,925 ft., elev. 3,330 ft., Wolfcamp 8,650 ft., Mississippian 10,180 ft., Devonian 10,625 ft., Silurian 10,840 ft., Simpson 11,600 ft., Ellenburger 12,825 ft.

Runnels County: Deep Rock Oil Corp. 1 Earle Black, Block 2, H. A. Thompson Sur., dry, TD 5,550 ft., Odom lime 5,216 ft., Ellenburger 5,360 ft.

Schleicher County: C. L. Norsworthy, Jr., 1 Ethel Williams, 77-M-GH&SA, dry, TD 6,823 ft., elev. 2,233 ft., Ellenburger 6,375 ft.

Stanolind Oil & Gas Co. 1 R. S. Williams, Sec. 1,204, TCRR Sur., dry, TD 8,087 ft., elev. 2,511 ft., Strawn 7,402 ft., Ellenburger 7,455 ft.

Sterling County: Lloyd R. French, Jr., 1 J. L. Glass, 20-22-H&TC, dry, TD 1,742 ft.

Tom Green County: Pan American Producing Co. 1 John Barron, 10-A-AB&M, dry, TD 5,521 ft., elev. 2,276 ft., reef 4,975 ft., Ellenburger 5,385 ft.

Yoakum County: Star Oil Co. 1-A Taylor Heirs, 200-D-J. H. Gibson Sur., dry, TD 12,484 ft., elev. 3,617 ft., Clear Fork 6,090 ft., Tubb 7,105 ft., Pennsylvanian 10,780 ft., Mississippian 11,570 ft., Woodford 12,262 ft., Devonian 12,344 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Forest Oil Corp. 1 H. L. Lowe, Devonian prospect in 25-13s-37e, northeast Lea County, found the water table in testing from 10,180-220 ft.

Earlier tests and recoveries were: From 9,835-99 ft., yield was oil and gas-cut water blanket plus 60 ft. of oil; drilling mud and water blanket were recovered from 9,898-9,952 ft. and gas-cut mud was developed from 9,952-10,005 ft.

From 10,131-80 ft., open 62 minutes, recovery was the water blanket, 2,160 ft. of slightly gas-cut mud, 4940 ft. of heavily oil and gas-cut mud, and 20 ft. of mud-cut oil. The drill pipe, unloaded after 5,400 ft., had been pulled.

Water was developed on the last reported test between 10,180-10,220 ft. and operators prepared to drill ahead. Location is about 7 miles north of the Denton Devonian field.

SOUTHEAST NEW MEXICO SUCCESSFUL WILDCAT

Chaves County: McMillan & Peterson 1-A State, 13-11s-27e, TD 2,065 ft., elev. 3,758 ft., pay sand 2,023-56 ft., IP pumped 62 bbl. 21°-gravity oil a day.

SOUTHEAST NEW MEXICO WILDCAT FAILURE

Roosevelt County: George P. Livermore 1 D. O. Bilberry, 1-7s-37e, dry, TD 4,450 ft., elev. 4,026 ft., San Andres 3,540 ft.

Louisiana-Arkansas

New Pay Zone Tapped In Old Arkansas Pool

SHREVEPORT.—The 30-year-old East El Dorado field, Union County, Arkansas, got a new deeper pay horizon at Saulsbury & Sons 1 Allen, a test in the middle of the field. Spotted in C NW SE SE 18-17s-14w, the well flowed 320 bbl. of 36°-gravity oil per day through 11/64-in. choke. Production is from the Glen Rose formation at 2,911-13 ft. Previous pay in the field was the Nacatoch around 2,170 ft.

Carter Oil Co.'s Columbia County deep wildcat will be completed as a dry hole. The 1 McMertise School, Section 29-19s-20w, had tested 470 ft. of gas-cut mud at 10,880-11,001 ft.

In northern Louisiana, H. L. Hunt et al.'s new Wilcox strike rated 186 bbl. of oil per day on official test. The operator is currently drilling on the confirmation test, 1 Beard et al., northwest of the successful E-2 Fisher Lumber Corp. located in Section 15-6n-7e.

Atlantic Refining Co. has staked a 7,000-ft. test in Bienville Parish. The company's 1 H. C. Cook is spotted 1,980 ft. west and 660 ft. north of SE corner of 21-16n-9w, north of Ringgold.

Louisiana Department of Conservation Order 137-B has been issued establishing 80-acre spacing for the recently discovered Woodruff oil sand area in Hico-Knowles gas-distillate field, Lincoln Parish. The new pay zone was opened by Southwest Gas and Feazel 1-A Peterson, Section 25-20n-4w. Description of the area includes: Sections 13, 14, 15, 22, 23, 24, 25, 26, 27, 35, and 36-20n-4w; and Sections 19, 20, 29, 30, 31, and 32-20n-3w.

(Continued on page 145)

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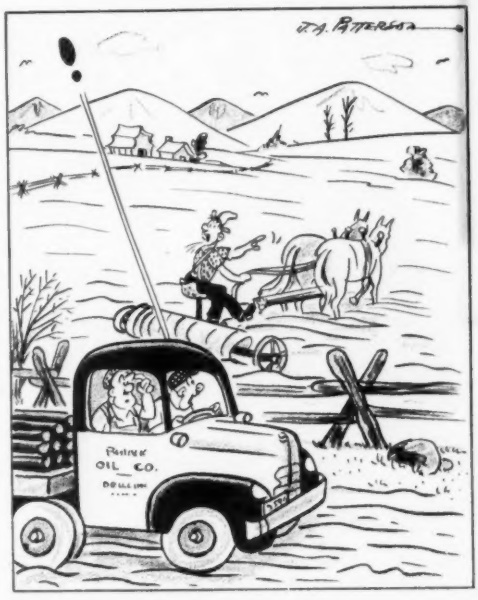

THE OIL AND GAS JOURNAL

"Well, ya' go a whoop and a holler down this road—a stone's throw to yore left and a couple of sow's squeals to yore right and yore thar!"

Illinois-Ind.-Ky.

Oil Production Indicated in Gibson County Wildcat

DISCOVERY of a new Aux Vases pool appears to have been made in the St. James area, 2 miles southwest of Haubstadt, in southern Gibson County, near the Vanderburgh County line, Indiana. The prospective discovery well, Al W. Cherry 1 Lutz, NW NW SW 13-4s-11w, found good saturation in a zone at 2,290-99 ft., and in a drill-stem test lasting 60 minutes flowed gas and filled 1,740 ft. of clean oil and 60 ft. of oil-cut mud with no indication of water. Operators have run 7-in. casing to 2,288 ft. and will move in standard tools for completion. The location is 2 miles from other production in the area.

The new Salem lime producing area opened by Harry H. Risher in the southeast corner of Gibson County has been designated officially as the Ireland pool. The discovery well, 1 Burris, NW NE NW 11-1n-5w, has been completed pumping 25 bbl. of oil natural per day with pay at 970-77 ft. The well is about 1½ miles southeast of Alfordsville, 9 miles north of Jasper, and is only ½ mile from the Martin County line to the east and 2 miles from the Dubois County line to the south. It is 5 miles from nearest present production.

Production of the Robards pool in Henderson County, western Kentucky, is being extended a half mile to the west where Delta Drilling Co. got a good oil flow in a drill-stem test of McClosky lime saturation at 2,512-33 ft. Oil was at the surface within 10 minutes after the tester was opened. Gas flowed in 3 minutes. Tool was open 35 minutes. Hole was drilled to 2,613 ft. and casing cemented on top of the pay. The location is 3 miles west of the town of Robards.

Collins Brothers Oil Co. 1 Meinert, NW NE SW 10-2s-2w, a rank wildcat in the Beaucoup vicinity, 4 miles northeast of Nashville, Washington County, Illinois, is being put on the pump for completion following swabbing tests in which it produced at the rate of 94 bbl. of oil per day. Pay zone is Devonian lime, logged at 3,070-80 ft. Location is 4 miles from nearest production.

ILLINOIS WILDCAT FAILURES

Bond County: H. H. Berrington 1 Logart, SW NW NE 22-4n-3w, dry, TD 1,150 ft.

Christian County: E. E. Goad et al 1 Garvey, NW NW NW 11-14n-3w, dry, TD 1,912 ft.

Clay County: D. H. Bolin 1 Smith, NE NE NW 15-3n-6e, dry, TD 3,060 ft.

George & Wrather 1 West et al, NE NE SE 22-4n-8e, dry, TD 3,130 ft.

Coles County: Sam Burkett 1 Patton, NE SW SE 34-13n-9e, dry, TD 600 ft.

Cumberland County: R. McDowell 1 Well, SE SW NE 34-9n-7e, dry, TD 2,585 ft.

Fayette County: C. J. Simpson 1 Wade, SE SE SW 4-4n-1w, dry, TD 1,610 ft.

F. Strickland 1 Hull, SW NW NW 28-5n-1e, dry, TD 3,097 ft.

National Associated Petroleum Co. 1-A Berman, NW NE NE 20-5n-4e, dry, TD 2,410 ft.

Washington County: Luttrell-Everhart and Ashland Oil & Refining Co. 1 Winter, NE SE NE 33-2s-3w, dry, TD 2,809 ft.

Wayne County: Ryan & Sharp 1 Armsborg, NE SW SW 10-1n-9e, dry, TD 3,289 ft.

INDIANA SUCCESSFUL WILDCATS

Daviess County: H. H. Risher 1 Burris, NW NE NW 11-1n-5w, IP 25 bbl., Salem 975-77 ft., TD 981 ft. (opens Ireland pool).

Posey County: Rush Creek Oil Co. 1 Lyke-Cox, SW SE NE 35-5s-14w, IP 8 bbl., Mansfield 1,423-40 ft., TD 1,440 ft. (opens Solitude West pool).

INDIANA WILDCAT FAILURES

Gibson County: K & H Drilling Co. 1 Blood, NE SW NW 13-3s-13w, dry, TD 2,399 ft.

Greene County: H. E. Morgan 1 Johnson, NE NW SW 20-6n-4w, dry, TD 600 ft.

Jackson County: Roberts & Jackson 1 Schrink, SW SE SE 35-7n-6e, dry, TD 271 ft.

Knox County: National Associated Petroleum Co. 1 Cox, Militia Donation, 92-3n-9w, TD 2,021 ft.

C. E. Tedrow 2 Frank, NW SE SW 36-2n-8w, dry, TD 1,294 ft.

Posey County: M. L. Vance 1 Fischer, NW SE NW 1-7s-13w, dry, TD 2,451 ft.

Spencer County: Lightfoot & Siddons 1 Mulzer, NE SE NE SW 30-5s-3w, dry, TD 2,257 ft.

Vanderburgh County: Missmer-Dietz 1 Hendricks, SE SE NE 20-7s-11w, dry, TD 1,048 ft.

EASTERN KENTUCKY

ASHLAND.—In Elliott County, Isonville pool area, Fred Kiskadden et al apparently have a producer at their 1 John F. Mason. Located 2 miles south of Isonville the test topped Weir sand at 873 ft. and bottomed the sand at 976 ft. Operators have shot well and are cleaning out prior to making production tests.

Further west in the same county and located on the Sandy Hook anticline, Ballard Lyons et al are drilling at 500 ft. at 1 Maude Click. This will be a Corniferous lime test unless production is assured in the Weir sand, the normal pay for this area.

In Floyd County on Abner Fork, Big Sandy gas field, Kentucky-West Virginia Gas Co. has a dry hole at its 5974 Jerry Osborn. Well topped Big Lime at 2,500 ft., Berea grit at 3,250 ft. and the Devonian black shales at 3,525 ft. Well was bottomed at 3,965 ft.

EASTERN KENTUCKY WILDCAT FAILURE

Greenup County: Dixie King Oil & Gas Co. 1 Wain Boggs, 3-Y-79, dry, TD 1,180 ft., Berea 459 ft., show oil and gas, Corniferous 1,133 ft.

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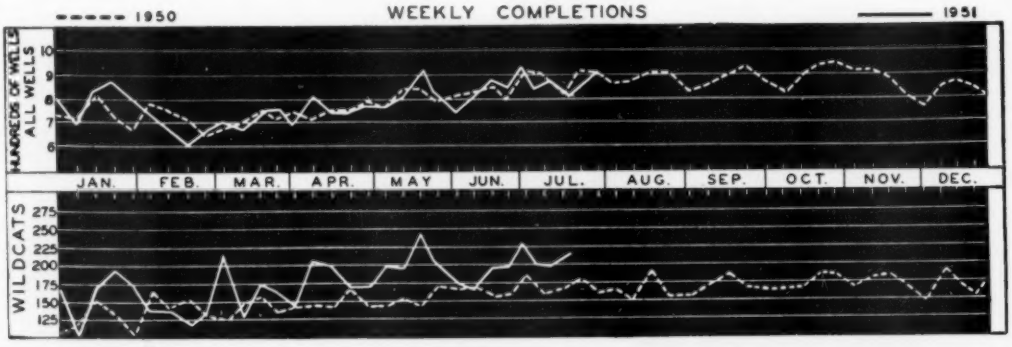
CURRENT STATISTICS

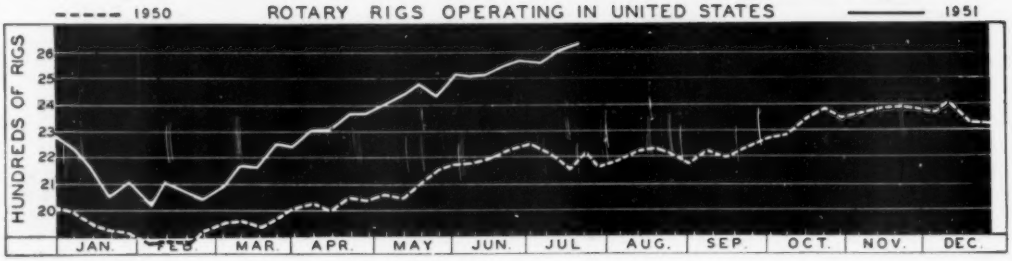
EXPLORATION

WEEKLY WELL COMPLETIONS . . . . WEEK ENDED JULY 28, 1951

	Total of all wells					July 28		Wildcat completions and discoveries									
													Cumulative total, 1951				
	Comp.	Oil	Gas	Dry	Footage	1951	1950	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	14	7	0	*7	20,748	277	283	0	0	0	0	0	0	0	0	0	0
Pennsylvania	15	5	3	*7	29,078	410	532	0	0	0	0	0	0	0	0	1	1
West Virginia	20	5	10	5	43,043	321	372	0	0	0	0	0	0	0	6	5	11
Ohio	16	8	3	5	33,936	500	561	0	0	0	0	0	1	0	4	15	20
Indiana	26	10	0	16	49,799	664	859	2	0	0	8	10	22	0	1	170	193
Kentucky	29	6	5	18	62,967	638	562	0	0	0	1	1	13	0	1	102	116
Illinois	57	21	0	†36	141,223	1,200	1,516	0	0	0	11	11	35	0	0	273	308
Michigan	22	5	0	‡17	52,078	432	500	0	0	0	9	9	15	0	6	171	192
Kansas	78	37	6	35	279,140	2,412	2,086	2	0	1	22	25	120	0	11	490	621
Nebraska	3	0	0	3	12,615	139	60	0	0	0	3	3	4	0	1	62	67
Oklahoma	125	68	7	§50	441,877	3,146	3,077	2	0	0	16	18	109	2	15	405	531
Texas	337	205	6	126	1,571,799	9,429	9,243	14	2	0	85	101	414	36	72	1,888	2,410
North Central (Dist. 7-B & 9)	102	41	0	61	343,704	2,875	2,863	6	0	0	39	45	205	2	9	810	1,026
West (Dist. 7-C & 8)	121	95	0	26	668,594	2,844	2,698	6	1	0	21	28	93	9	5	360	467
Panhandle (Dist. 10)	9	4	4	1	26,126	387	536	0	0	0	0	0	2	0	0	14	16
Eastern (Dist. 5 & 6)	19	12	0	7	88,010	692	646	1	0	0	6	7	6	4	0	127	137
Gulf Coast (Dist. 2 & 3)	41	20	2	19	258,531	1,328	1,293	1	0	0	10	11	57	14	37	272	380
Southwest (Dist. 1 & 4)	45	33	0	12	186,834	1,303	1,207	0	1	0	9	10	51	7	21	305	384
Louisiana	52	28	7	17	328,109	1,158	1,406	1	1	0	6	8	25	4	4	148	181
Northern	25	13	4	8	62,356	601	737	0	0	0	2	2	7	0	3	83	93
Southern	27	15	3	9	265,753	557	669	1	1	0	4	6	18	4	1	65	88
Arkansas	8	5	0	3	24,215	218	236	0	0	0	2	2	8	0	2	42	52
Mississippi	12	4	0	8	70,819	185	181	0	0	0	6	6	7	3	0	63	73
Southeastern States	2	1	0	1	10,055	38	37	0	0	0	0	0	0	0	0	14	14
Montana	2	0	0	2	5,884	125	115	0	0	0	0	0	0	0	0	27	27
Wyoming	16	12	0	4	85,689	412	325	0	0	0	1	1	7	0	0	54	61
Colorado-Utah	5	1	0	4	31,900	153	48	0	0	0	3	3	5	0	4	77	86
New Mexico	17	9	1	7	101,170	389	349	1	0	0	1	2	10	0	7	46	63
California	58	45	1	†12	241,122	1,259	1,005	4	0	0	11	15	31	0	1	248	280
Miscellaneous (Md. and Iowa)	2	0	1	1	5,921	30	9	0	0	1	1	2	0	0	18	11	29
Total United States	916	482	50	384	3,643,187	23,535	23,362	26	3	2	186	217	826	45	153	4,312	5,336
Total previous week	814	413	60	341	3,175,821			39	1	7	169	216	800	42	151	4,126	5,119
Total July 28, 1950	907	499	55	353	3,309,135			23	1	3	136	163	607	43	112	3,512	4,274

Service wells included: *7, †1, 15, §2. Misc. includes: Md. 1 gas well at 3,864 ft., Iowa 1 dry hole at 2,057 ft.





DAILY AVERAGE PRODUCTION FOR WEEK

	July 28 crude oil	B. of M. Aug. demand	July 21 crude oil
Alabama	2,950	2,400	3,100
Arkansas	76,850	85,000	76,600
California	978,600	980,000	977,500
Colorado	72,100	80,000	71,600
Eastern	60,000	64,000	60,850
Florida	1,725	1,600	1,650
Illinois	169,400	165,000	171,300
Indiana	30,000	29,000	29,500
Kansas	331,150	320,000	293,600
Kentucky	30,300	29,000	28,900
Louisiana	612,475	671,000	611,725
North Louisiana	114,900		114,150
South Louisiana	497,575		497,575
Michigan	40,100	42,000	37,900
Mississippi	100,500	104,000	99,950
Montana	23,300	24,000	23,200
Nebraska	6,250	10,000	6,350
New Mexico	147,125	154,000	147,125
Oklahoma	506,750	530,000	508,050
Texas	2,744,750	2,690,000	2,744,750
Dist. 1 (Southwest)	33,050		33,050
Dist. 4 (Southwest)	253,275		253,275
Dist. 2 (Gulf Coast)	160,625		160,625
Dist. 3 (Gulf Coast)	470,825		470,825
Dist. 5 (Eastern)	54,625		54,625
Dist. 6 (Eastern)	115,800		115,800
East Texas field	271,300		271,300
Dist. 7-C (West)	101,100		101,100
Dist. 8 (West)	957,000		957,000
Dist. 7-B (W. Central)	81,875		81,875
Dist. 9 (N. Central)	157,750		157,750
Dist. 10 (Panhandle)	87,525		87,525
Utah	4,000	5,000	4,100
Wyoming	194,600	178,000	195,200
Total United States	*6,132,925	6,164,000	6,092,950
Change from previous week	up 39,975		
Canada	165,105		165,340

Total U. S. production January 1-July 28 †1,241,347,410 bbl.
Same period last year (crude plus cond.) 1,070,729,440 bbl.

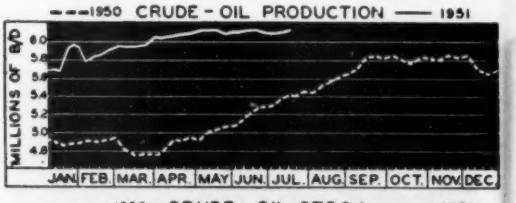
*Not including 99,705 bbl. condensate. †Including 22,142,330 bbl. condensate.

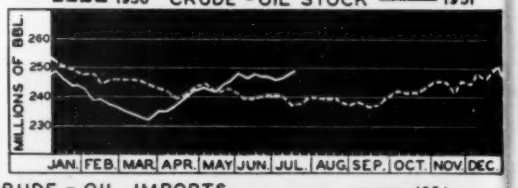
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

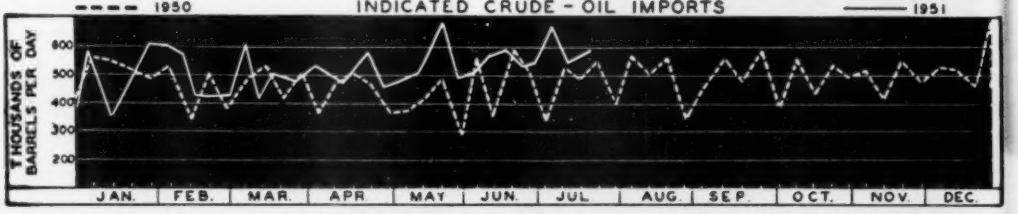
(Thousands of barrels)

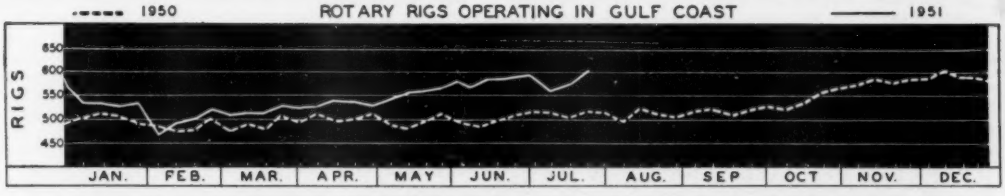
	July 21, 1951	July 14, 1951	July 22, 1950
Pennsylvania Grade	2,135	2,131	2,702
Other Appalachian	1,461	1,517	1,434
Illinois, Indiana, Michigan	10,830	11,050	9,340
Arkansas	2,936	2,874	2,773
Louisiana	13,954	14,280	15,069
North	2,691	2,864	3,263
Gulf	11,263	11,416	11,806
Mississippi	2,933	3,102	2,243
New Mexico	6,327	6,605	5,949
Oklahoma and Kansas	38,033	37,431	33,472
Texas	116,413	115,574	113,511
East Texas	13,775	13,954	15,289
West Texas	47,715	48,529	42,089
Texas Gulf	27,284	25,909	27,477
Other Texas	27,639	27,182	28,656
Rocky Mountain	14,027	13,964	12,069
California	30,904	30,391	34,245
Foreign	9,059	8,846	6,844
Total	249,012	247,765	239,651

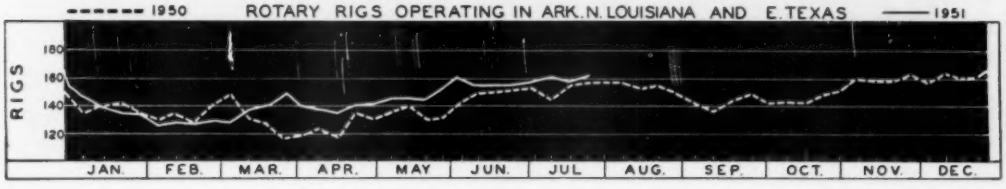
*Bureau of Mines.









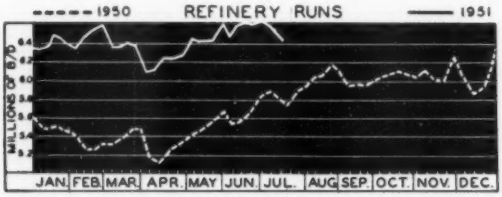

1950 ROTARY RIGS OPERATING IN ARK. N. LOUISIANA AND E. TEXAS 1951
RIGS
180
160
140
120
JAN. FEB. MAR. APR. MAY JUN. JUL AUG. SEP. OCT. NOV. DEC.

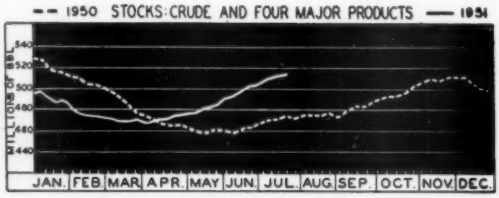
A.P.I. REFINERY REPORT, JULY 21

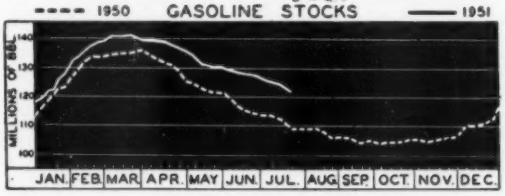
(Thousands of barrels)

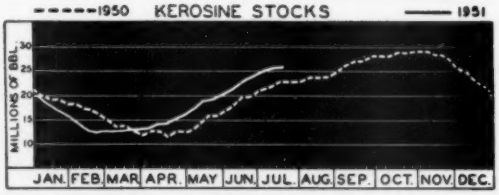
District—	Daily avg. crude runs	Daily average production: Gasoline*	Kerosine	Distillate	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline†	Kerosine	Distillate	Residual	Bureau of Mines, July 1950: Daily avg. crude runs	Daily average production: Gasoline*	Kerosine	Distillate	Residual
East Coast	993	397.0	40.1	200.1	218.7	27,158	10,075	22,442	11,512	964	402.1	34.3	192.9	213.7
Appalachian:														
District 1	92	35.4	5.6	11.1	8.0	2,818	595	917	367	98	44.6	5.1	12.7	10.2
District 2	80	37.9	8.0	4.3	21.8	1,302	302	365	276	71	32.8	3.1	8.3	14.3
Ind., Ill., Ky.	1,240	656.6	74.7	215.9	170.3	27,545	5,597	16,353	4,804	1,090	585.6	53.2	159.8	144.8
Okla., Kans., Mo.	476	259.8	20.4	1[illegible]3	61.8	13,636	1,501	8,739	1,737	522	284.9	16.2	106.2	54.7
Inland Texas	270	163.9	16.6	43.3	44.1	3,268	519	1,425	940	214	137.2	10.8	30.2	42.3
Texas Gulf Coast	1,525	717.0	130.2	338.7	289.0	17,858	4,724	9,565	4,569	1,267	595.0	100.3	245.1	229.8
La. Gulf Coast	500	228.4	36.1	126.7	72.6	5,977	1,875	3,748	1,701	487	227.9	47.9	105.1	58.5
N. La. and Ark.	83	33.0	7.6	13.4	7.9	2,655	477	844	121	74	28.4	6.9	13.9	12.3
Rocky Mountain:														
New Mexico	14	8.4		2.9	3.6	125		63	29	14	7.4	.3	2.2	3.6
Other Rocky Mtn.	227	110.9	3.3	42.9	47.6	5,091	328	1,707	1,242	196	85.3	5.0	38.2	35.6
California	906	403.6	11.3	137.3	335.0	14,671	409	8,528	16,848	885	403.4	10.2	125.8	320.1
July 21, 1951	6,406	3,051.9	353.9	1,245.9	1,280.4	122,104	26,402	74,696	44,146	5,882	2,834.6	293.3	1,040.4	1,139.9
July 14, 1951	6,561	3,140.7	337.4	1,242.1	1,290.4	124,157	25,863	72,306	43,239					
July 22, 1950	5,757	2,822.0	264.0	1,023.7	1,150.9	108,915	22,766	59,434	42,424					

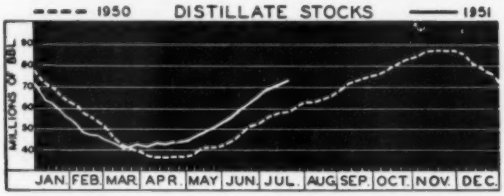
*At refineries including natural blended. †Finished and unfinished.

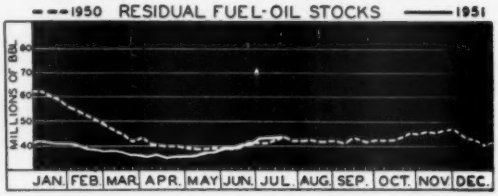


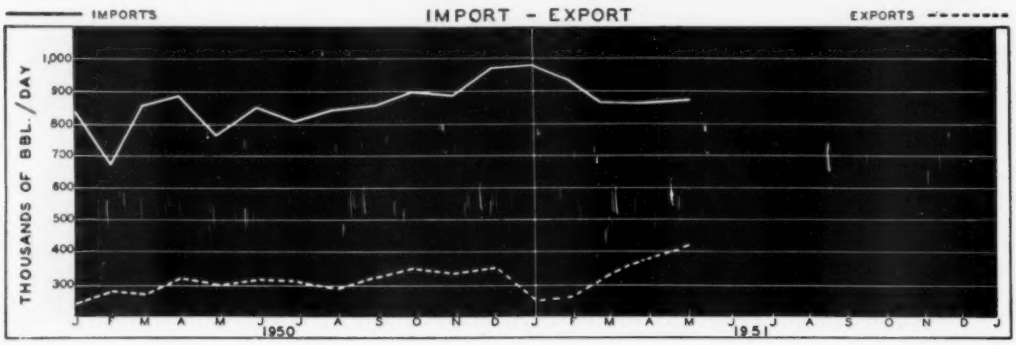












CRUDE PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.‡	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.93	....	....	....
19-19.9	1.98	....	....	....
20-20.9	2.03	$2.25	....	$2.12
21-21.9	2.07	2.27	....	2.14
22-22.9	2.12	2.29	....	2.16
23-23.9	2.18	2.31	....	2.18
24-24.9	2.24	2.33	$2.56	2.20
25-25.9	2.30	2.35	2.58	2.22
26-26.9	2.36	2.37	2.60	2.24
27-27.9	2.41	2.39	2.62	2.26
28-28.9	2.46	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.57	2.45	2.68	2.32
31-31.9	2.62	2.47	2.70	2.34
32-32.9	2.68	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947.

‡Standard Oil Co. of California.

FLAT CRUDE PRICES

Representative posted schedules per barrel.	
East Texas†	$2.65
Kettleman Hills, California*	2.50
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	4.25
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

MODERATE easing in the Mid-Continent tank-car shortage was indicated near the end of the last week of July. The tight car situation developed when rail shipments were increased to move supplies to areas where products were in demand because normal supplies by pipe line were cut off by the flood in Kansas.

Pipe-line stocks of gasoline at points above Kansas City on the Great Lakes Pipe Line are being reduced due to restricted movement through the line in the Kansas City area. However, stocks are increasing at supplying refineries below Kansas City. This backing up of stocks at some Oklahoma and Kansas refineries has resulted in a reduction in crude runs at some plants. Other refineries in the flood areas are still down or operating at reduced rates. The combination of these two factors resulted in a reduction of 70,000 bbl. daily in runs for the Oklahoma-Kansas district the week ended July 21.

A possible explanation for firm gasoline prices in the Group 3 area despite large gasoline inventories is the fact that most of the small refineries, where distress gasoline could produce a soft market, have contracted their output through August.

Some of the large suppliers seem to be pulling out of the gasoline war at service stations in the Philadelphia-Lower New Jersey area and in parts of New England. Atlantic Refining Co. announced an increase of 2 cents a gallon in tank-wagon prices for gasoline in the Philadelphia-South Jersey area. Socony-Vacuum Oil Co., Inc., increased gasoline prices in parts of New England to the levels that existed before the cuts at the end of April. Sun Oil Co. was reported to be meeting both increases.

Softening tanker rates reflected the greater number of tankers available for early loading because of transportation shifts brought about by the Iranian situation. Most observers expect higher rates as soon an Abadan customers locate other supplies.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of July 30, 1951. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	10¼-10½	12-12.75	10¾-11
Premium gasoline, 86-88 octane	11¼-11½	13.5-13.75	11¾-12
42-44 w.w. kerosine	9-9⅜	10	9
No. 2 straw fuel oil	8-8⅛	9	8
No. 6 residual	$1.75-1.80	$2.45-2.60	$1.75-1.90

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5½	5	5¼
Grade 18-55	6.6	6.1	6.35

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	13-13.5
750 vis., No. 3-4 neutral	16
2,000 No. 5-6 neutral	18-19

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	29-30
200 vis., No. 3 neutral, 0-10 pp.	17.5-18.5

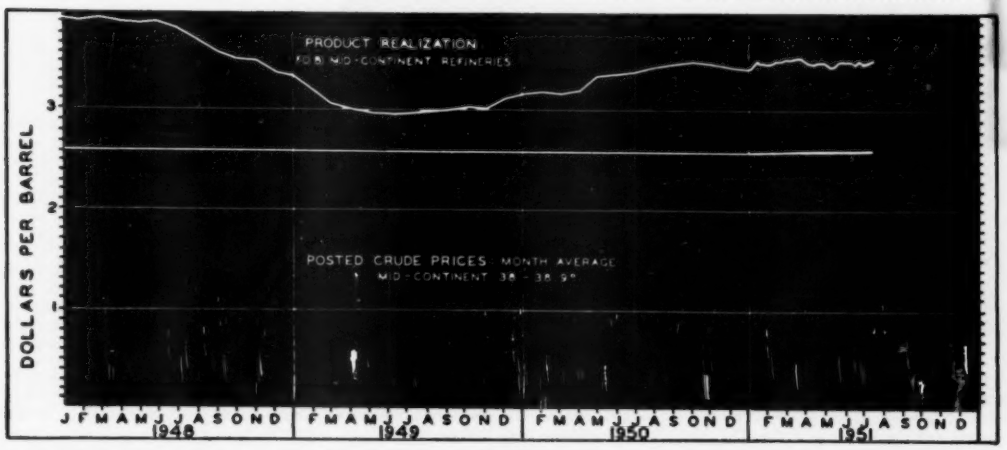
Western Pennsylvania

145-155 vis., 10 p.t. bright stock	33.5
180 vis., 0 p.t. neutral	31.5

WAX

Mid-Continent

132-134 A.M.P.	6.0


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
POSTED CRUDE PRICES MONTH AVERAGE
† MID-CONTINENT 38 - 38.9°
DOLLARS PER BARREL
3
2
1
J F M A M J J A S O N D
1948
F M A M J J A S O N D
1949
F M A M J J A S O N D
1950
F M A M J J A S O N D
1951

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate, and fuel oil. Realization averaged $3.54 for week ended July 21, $3.52 for previous week, and $3.43 for July 1950.

EQUIPMENT MEN . . . in the News

Magnet Cove Opens Rocky Mountain District Office

C. W. CLARK, JR.

Magnet Cove Barium Corp. has opened a new district office in Casper, Wyo., to serve the Rocky Mountain region as part of its expanding program of service to the oil industry, Willard Johnson, president, has announced. C. W. Clark, Jr., has been appointed manager of the Rocky Mountain division with headquarters in Casper.

J. T. WEBSTER

J. H. McLAURIN

Other new appointments include Joe T. Webster, named manager of the Texas Gulf Coast division with offices in Houston; and James H. McLaurin, appointed manager of the southeastern division with offices in New Orleans.

Nowicki Made District Manager for Ampco Metal

Ampco Metal, Inc., Milwaukee, Wis., announces the appointment of Harry Nowicki as district manager of its East Texas division, with headquarters at Houston. Nowicki formerly was field engineer in the Chicago district office.

Sam Coddington, Wisconsin district field engineer, has been transferred to the Chicago district, replacing Nowicki.

M&R Specialty Adds Nance To Management Staff

M. (Bink) Manning of M&R Specialty Co., oil-well service and supply contractors, has announced that A. A. Nance, foreign employe-relations advisor of Standard Oil Co. (N. J.), New York, has joined M&R on August 1.

After graduating from Texas A.&M. College in 1931, Nance was employed by Humble Oil & Refining Co. in engineering and industrial relations. During his affiliation with Standard, Nance served as an advisor on employe-relations matters for Standard-Vacuum Oil Co., which operates in the Near and Far East, including India, China, and Japan, and other oil and pipe-line companies in Venezuela, Colombia, Peru, the Netherlands West Indies, Europe, and the Near and Middle East.

Nance will assist Manning in the management and operation of M&R Specialty Co.

Three Cooper-Bessemer Engineers Advanced

Several changes in Cooper-Bessemer's engineering organization have been made public by Ralph L. Boyer, vice president and chief engineer.

In addition to Boyer and E. Frederick, assistant chief engineer, Cooper-Bessemer's new office of chief engineer now includes T. O. Kuivinen, R. F. Kymer, and W. R. Crooks, who are serving as chief engineer's assistants.

Technical matters will be handled by Kuivinen, and liaison or coordination of activities between engineering and production will be directed by Kymer. Crooks will assist in general administrative capacity as well as direct his efforts in research and development projects.

Prepares Paper

John N. MacKendrick, left, vice president in charge of engineering for Clark Bros. Co., Inc., is complimented by George H. Pfefferle, right, director of engineering for Dresser Industries, Inc., for his paper on "Operating a Direct Connected Engine Driven Compressor as a Generator," prepared by MacKendrick in collaboration with George Bollman and C. A. Chamberlain, project engineers for Clark Bros. The paper was presented by MacKendrick at the Dallas meeting of the American Society of Mechanical Engineers.

Allan Edwards Adds Engineers to Staff

Allan Edwards, president of Allan Edwards, Inc., Tulsa, has announced the appointment of two staff engineers, J. D. (Jeff) Irons and Dave Moss. Irons is a graduate in petroleum engineering from Tulsa University and joined Edwards as chief engineer in 1948, later joining Peerless Manufacturing Co. also as chief engineer. He developed the Peerless hi-surface horizontal separator and holds patents in the natural-gas-dehydrating field.

DAVE MOSS

J. D. IRONS

Moss is a metallurgical-engineering graduate of Michigan College of Mining and Technology. He was formerly employed as a research and process metallurgist of Western Cartridge Co., and a contact metallurgical engineer in the Mid-Continent area for Jos. T. Ryerson & Son, Inc.

Allan Edwards, Inc., is the manufacturer and distributor of pipe-line weights and other pipe-line specialties.

Smith Contracting Corp. to Auction Surplus Equipment

Smith Contracting Corp., which recently completed a 200-mile stretch of 30-in. for a major pipe-line company, will auction off $1,500,000 in pipe-line equipment at public sale at Manassas, Va., Tuesday, August 7. Hetz Auction Sales, Warren, Ohio, will handle the sale.

The little-used equipment, which has been reconditioned, includes earth-moving and plate-fabrication machinery. Most of it was purchased new in 1950, and used only a few months during the activity on the pipe-line project.

The firm will also auction off later this year a large assortment of additional equipment at its Fort Worth yards.

Smith Contracting is disposing of the equipment because it is surplus to their normal requirements in regular Texas-area work.

Goodyear Names Harper, Sabine to New Posts

S. R. HARPER

R. W. SABINE

Richard W. Sabine, former senior staff man in charge of mechanical-goods advertising and sales promotion for Goodyear Tire & Rubber Co., has been named manager of distributor sales in the company's mechanical-goods division, succeeding W. T. Bell, deceased. Sabine was a sales correspondent for Hardwood Products Co. before joining the Akron rubber firm in 1942.

Sheldon R. Harper has been placed in charge of sales promotion and advertising for the mechanical-goods division of Goodyear, replacing Sabine. Harper joined Goodyear Aircraft Corp. in 1940. In 1950 he joined Goodyear's squadron-training program and was transferred to the company's sales-promotion department the same year.

Mid-East Supply Opens Fairfield Store, Plant

Mid-East Supply & Machine Co. announces the recent purchase of a shop and store at Fairfield, Ill. The concern specializes in manufacture and repair of oil-field equipment in addition to acting as parts and service dealer for the Illinois, Indiana, Kentucky, and Ohio area for Cardwell Manufacturing Co.'s oil-well machinery.

Fairfield will be Mid-East's home office, with Walter Stovall, formerly with W. L. Widick Co., McLeansboro, Ill., in charge.

First Conference Held by Kold-Hold Platecoil Division

The first national sales conference of the new Platecoil division of Kold-Hold Manufacturing Co. held in Lansing, Mich., was keynoted by James R. Tranter, president of the company, who showed how the many advantages of its product have won national acceptance for it in less than 2 years. Other sessions were conducted by Jack R. Tepfer, general sales manager, and C. P. (Bill) Yoder, sales manager of the Platecoil Division.

Representatives attending were: G. S. Ewing, W. H. Eckhard and W. K. Duff, New York; William Horblit, Denver; Walter C. Edge, M. P. Edge, George M. Phillips and John J. Carroll, Philadelphia; H. R. Houghton, Baltimore; S. F. Brooks, Jr., Indianapolis; Hubert Glatte and Alfred F. Macklin, Cleveland; John S. Bower, Cincinnati; T. F. Hilgenberg, Milwaukee; Walter G. Barstow and Arnold J. Nordenson, Minneapolis; W. P. Nevins, E. J. Nevins, F. A. Powers, F. W. Winkler and F. A. Sasso, Chicago; Russell Patton and John Hallowell, St. Louis; Wm. B. Parsons, Jr., and Frank L. Bridges, Boston; Richard B. Hogue, Buffalo; Carl E. Johnson, Atlanta; A. W. Anderson, Pittsburgh; Jos. Cantwell, Albany; Jay Korest and J. W. Peterson, Detroit, and J. A. McDonald, Canada.

Worthington Moves Unit

Sales and engineering functions of the water-treating section of Worthington Pump & Machinery Corp. have been moved from the company's Dunellen, N. J., plant to its Harrison, N. J., plant, according to T. J. Kehane, general sales manager.

The engineering function for the water-treating section will continue under the supervision of J. F. Sebald, and the sales function under A. L. Jones.

Menns Appointed Pacific Coast Sales Manager

Bridgeport Brass Co. has announced the appointment of L. E. Menns as its Pacific Coast sales manager.

Menns, who has been serving as Los Angeles district manager for Bridgeport, will be in charge of the San Francisco district office and warehouse.

Wall Colmonoy Opens Office, Warehouse at Houston

Wall Colmonoy Corp. has announced the opening of a new office and warehouse in Houston, and Henry L. Howard has been appointed manager.

Prior to his present appointment, Howard was on the staff of a large welding distributor in Texas as a sales engineer. He has also been associated with Goodyear Aircraft Co. and Republic Steel Co. as a welding engineer.

Dowell Holds Second Annual Tri-State Barbecue

Dowellers in charge of the annual tristate picinc of Dowell Incorporaed were, from left to right: Bernard Langley, Salem; Reese Bennett, Mount Carmel; Fred Milner and J. C. Johnson, Flora; Wray Love, Salem, district manager; and Leo Kutlich, Flora.

The second annual tristate barbecue was held by Dowell Incorporated July 7 at the company station in Flora, Ill. More than 950 invitations were extended to operators in the tri-state area, which includes Illinois, Indiana, and western Kentucky, and approximately 500 attended. This annual affair originated with the official opening of the Mount Carmel station last year.

The Flora station is part of one of Dowell's largest districts, the Salem district. It includes offices and stations in Mount Carmel, St. Louis and Chicago Heights, Ill.; Anniston, Ala.; and extends as far south as Jacksonville, Fla.

Dowell personnel from many of these offices attended as well as several of the company officials from the general office in Tulsa. They included, from Salem: Wray Love, Bernard Langley, J. C. Johnson, N. J. Berry, J. L. Dodson, Fred Milner, J. A. McClure, and C L. Kirgan; from Flora, Guido Grady, L. R. Bales, I. R. Bielek, Don Dampf, T. W. Hennessey, G. V. Lee, J. F. Prince, H. D. Tatum, D. W. Wile, W. Morris, C. E. Pickering, O. L. Boyd, F. L. Combs, R. R. Coble, R. J. Dunigan, J. L. Fleener,

S. R. Graham, W. E. Lee, T. B. Mitchell, M. E. Raley, W. G. Raley, and G. R. Hogan; and from Mount Carmel, Reese Bennett, John Crane, Tony DiPrimo, W. Haywood, R. W. Martin, B. G. Jones, R. G. Case, K. R. Courtright, R. W. Dunlap, J. R. Jay and J. L. Reeves.

National Geophysical Makes Personnel Changes

National Geophysical Co., Inc., Dallas, announces the following personnel promotions and transfers:

R. L. Boulware, National Geophysical Co. of Canada, Ltd., promoted from party chief to supervisor; Corby Hart, transferred from National of Canada, Ltd., and promoted to supervisor at Dallas; E. L. Campbell transferred to Midland, Tex., and promoted to supervisor in charge of West Texas operations; and J. H. Frazer, promoted to supervisor in National of Canada, Ltd.

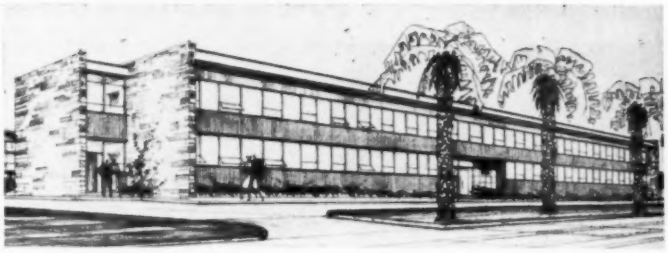
Four Appointments Made By Oil Well Supply Co.

Several appointments in Oil Well Supply Co.'s Coast division were announced recently by F. D. Smith, division manager for this United States Steel Co. subsidiary.

Donald F. Greenlaw, formerly manager of the Victoria, Tex., store, has transferred to Alice, Tex., as assistant to the district merchandise manager. He is succeeded by Edward D. Haas, manager of the Mirando City, Tex., store. The new manager of the Mirando City store is Joseph P. Higgins, field representative at Freer, Tex., for the past year. Rush L. Johnson, storeman at Alice, has been promoted to field representative at that city.

Harris W. Quaite has been named division office manager at Houston. Quaite takes his new post from Wichita Falls, Tex., and succeeds R. R. George, division office manager since February 1949, who is transferring to Calgary, Alta., Canada.

New Office Building of Fluor Corp. Started



Shown above is an artist's sketch of the new Fluor Corp. engineering building now under construction at Houston.

Construction is proceeding on a new engineering building for Fluor Corp., Houston. The structure will contain 15,000 sq. ft. on two floors, and will have complete engineering and design facilities for Fluor's operations in the Houston area. The design embodies the latest ideas in office building construction.

Completion of the project is contemplated by the end of 1951.

Bowen to Represent Agate In Mid-Continent Area

L. H. (Harley) Bowen, formerly in charge of subsurface sales for Republic Supply Co., has been appointed Mid-Continent area representative for Agate Corp., according to R. B. Pridgeon, general manager. Bowen will be responsible for development of Agate filter sales and service in the Mid-Continent and will make his headquarters in Houston.

Bowen is known throughout the Mid-Continent area as an authority on subsurface equipment and has a background of 17 years' experience on pumps and related subsurface tools. Before joining Republic in 1946 he represented pump companies in Texas, Oklahoma, Kansas, Illinois, and Indiana, and is familiar with many of the production problems in these areas.

New Welex Field Station To Service Hobbs Area

Weltex Jet Services, Inc., has recently opened a field station at Hobbs, N. M., for servicing that area with Welex jet casing-perforating service, torpedo-jet open-hole shooting, and Baker bridge-plug service.

Ray H. Williams, who has been with Welex as sales engineer at Hobbs for the past year and a half, is station manager. W. D. Smith has been promoted as assistant manager at Hobbs.

American Meter Elects Diehl as Board Chairman

American Meter Co., Inc., manufacturer of displacement gas meters, orifice meters, regulators, and other related products, has announced the election of John C. Diehl as chairman of the board.

Diehl joined American Meter in 1919 as an engineer and became chief engineer in 1929. In 1934 he was elected director, and in 1943 he was made vice president. In August of 1950 Diehl became president, which position he held until his recent election as chairman of the board of directors.

Lane-Wells Occupies New Office Building

The Mid-Continent division of Lane-Wells Co. has moved its offices into this newly constructed Oklahoma City location. The modern building is of functional-contemporary design featuring comfortable customer facilities including a large parking area.

Toro Manufacturing Purchases New Plant

Toro Manufacturing Corp., makers of power lawn mowers, has purchased a new plant at Windom, Minn., from Mooers Co. Windom will go into operation in the fall when additions to the present building are completed.

The new site includes a plant area of 20,000 sq. ft., warehousing, and six-and-a-quarter acres of land. Built in 1946, the plant is located on two principal state highways, with railroad, power facilities, and ample expansion room.

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY... CLASSIFIED ADVERTISING

DISPLAY CLASSIFIED
$12.00 a column inch one issue . . .
10% Discount three or more issues.

UNDISPLAYED CLASSIFIED 12c a word one issue. 10% Discount three or more issues. $3.00 minimum charge. Blind Box in our care counts nine words. Payable in Advance.

EQUIPMENT FOR SALE

USED ROTARY AND CABLE TOOL DRILLING TOOLS, WIRE LINES, E. A. KELLY, BOX 861, OKLAHOMA CITY. PHONE 5-6407.

NATIONAL "50" Compound Double Drum Rig 126′ Cantilever Ideco-Moore Mast, 10′ substructure, 5000′ 4½" drill pipe, this rig complete and in excellent condition. 273 Hermosa Drive, Bakersfield, California. Ph. 53701.

FOR SALE: One drilling rig complete including 127′ Lee C. Moore mast and 7,200′ of 4½" drill pipe. Rig capacity 7,500 ft. Now operating in Oklahoma. All equipment A-1 mechanical condition. For further details and inspection write Box E-132, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE

Good Used 6⅝" O. D. 8 thread line pipe couplings — cleaned or uncleaned. Write or wire Box 574, Tulsa, Okla.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

FOR SALE

Mayhew Model 2000 Drill. Mounted on 1948 Chevrolet—Thornton Tandem. New Gardner-Denver 4½ by 6 Pump. Auxiliary Motor. 40-Foot Hydraulic Lift Mast. Sacrifice for Quick Sale.

Frank Herring
303 Orpheum Building Telephone 3-1507
Wichita, Kansas

FOR SALE

CASING AND TUBING NEW & USED

10000′—7" OD 20# L.W. Used Casing
10000′—5½" O.D. 17# L.W. Used Casing
5000′—5½" O.D. 13# L.W. Used Casing
20000′—2" REG: L. W. R-1 Tubing
7200′—10¾" O.D. 31.20# P.E. G.B. Line Pipe, New
10000′—5½" O.D. 14# S. 10V R-2 Casing. Used
20000′—2" E.U.E. 4.70 10V & 8-R Used S Tubing.

Sabine Machine & Supply Co.
Kilgore, Texas
Phone 3094, 3095, 3436

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

DRILLING Mud. Colo. Bentonite, it swells, it jells. Few equal, none better. Send for sample. Our price saves you money. Pressey & Sons, Pueblo, Colorado.

FOR SALE: R. L. Cardwell with GAK Waukesha, 1st class condition, $5,000. One super model Wilson single drum servicing unit, 80 hp. Waukesha, 4,000′ wire, all tubing tools, mounted on GM 4-wheel drive truck. $3500. Phone Rogers Pipe and Supply Co., Tulsa, Okla.

EQUIPMENT FOR SALE

PIPE
ALL SIZES: LINE PIPE AND CASING, TANKS, AND OILFIELD SUPPLIES. EDCO PIPE & SUPPLY CO., PHONES 933 OR 1298, DRUMRIGHT, OKLA.

WILSON Super Winch, 145 GKU Engine, 65 foot double pole, on Chevrolet tandem truck. Wilson Super Winch, 140 GKU Engine, 42 foot hydraulic mast, on L-10 International tandem truck. Both rigs equipped with block, hook, swivel, B.O.P., etc. Ready to work. Also two late model Chevrolet pick-up trucks. Price an application. Write W. C. Fatjo, Inc., P. O. Box 414, Lafayette, La., or call 5-6137.

PIPE FOR SALE!

UNUSED STANDARD BLACK LINE PIPE:

350,000′ ½" Standard Black, Plain Ends, 21′ Lengths.
25,000′ ¾" Standard Black, Plain Ends, 21′ Lengths.
70,000′ 1" Standard Black, Threaded & Coupled, 21′ Lengths.
120,000′ 1¼" Standard Black, Plain Ends, 21′ Lengths.
110,000′ 1½" Standard Black, Plain Ends, 21′ Lengths.
100,000′ 2" Standard Black, Plain Ends, 21′ Lengths.
8,000′ 2½" Standard Black, Threaded & Coupled, 21′ Lengths.
10,000′ 3" Standard Black, Plain Ends, 21′ Lengths.
3,200′ 3½" Standard Black, Plain Ends, 21′ Lengths.
150,000′ 4" (4½" O.D.) 8.7# Welded Line Pipe, Beveled Ends, 30′-40′ Lengths.
72,000′ 4" (4½" O.D.) 10.79#, Lapweld, 40′ Lengths, Double Jointed.

UNUSED SEAMLESS STEEL TUBING, RANDOM MILL LENGTHS:

5,000′ 1½" O.D. x Approx. .120/.134" Wall, 1.85#.
25,000′ 1.900" O.D. x Approx. .390/.415" Wall, 6.23#.
15,000′ 2" O.D. x Approx. .130/.165" Wall, 3.01#.
6,500′ 2¼" O.D. x Approx. .170/.190" Wall, 3.89#.
5,000′ 2⅜" O.D. x Approx. .300/.375" Wall, 7.5#.
5,000′ 2½" O.D. x Approx. .130/.160" Wall, 3.72#.
3,000′ 2½" O.D. x Approx. .188/.250" Wall, 5.48#.
2,000′ 3" O.D. x Approx. .188" Wall, 5.42#.
3,000′ 3" O.D. x Approx. .200/.250" Wall, 7.2#.
8,000′ 3" O.D. x Approx. .270/.320" Wall, 8.7#.
3,000′ 3" O.D. x Approx. .300/.350" Wall, 9.65#.
3,000′ 3¾" O.D. x Approx. .375/.438" Wall, 14.5#.
10,500′ 4" O.D. x Approx. .140/.160" Wall, 6.4#.
3,000′ 5" O.D. x Approx. .600/.650" Wall, 29.2#.
2,000′ 5¾" O.D. x Approx. .370/.450" Wall, 23.2#.
1,000′ 6¼" O.D. x Approx. .170/.210" Wall, 13.0#.
1,000′ 6¾" O.D. x Approx. .180/.250" Wall, 15.2#.

This material is excellent for welded gas or flow lines; minimum and maximum wall thicknesses available for high and low pressure work.

ACT NOW! PHONE OR WIRE COLLECT YOUR REQUIREMENTS TODAY

A. J. STRUBEL, Broker
SIDney 1781 (Day Phone) HUDson 8152 (Night Phone) 4846 Murdoch, St. Louis, Mo.

EQUIPMENT FOR SALE

CASING PULLING CONTRACTORS with Hydraulic Equipment: Experienced operators—Pull any size pipe, anywhere. Also will buy wells for salvage. GENERAL CASING PULLING CO., P.O. Box 4387, Oklahoma City. Phone 6-1335.

SEAMLESS CASING & TUBING

2400′ 7″ O.D. 20 lb. Grade C seamless 10V good used seamless casing
800′ 7″ O.D. 20 lb. Grade C seamless 10V good used seamless casing
3500′ 10¾″ O.D. 40½ lb. 8 round J-55 good used seamless casing
5000′ 5½″ O.D. 14 lb. H40 8 round good used seamless casing
3100′ 2½″ O.D. 6.70 lb. 8 round J55 EUE good used seamless tubing

FRANK MORRIS & CO.
4245 S. Cheyenne, Tulsa, Okla.
Phone 2-6247

EQUIPMENT FOR SALE

FOR SALE: Bucyrus Erie Model 24L Spudder, Trailer Mounted, Steel Dog House, some Drilling tools. F.O.B. Bartow, Florida, $6,500.00. Would consider 33W Model or Similar Unit in Trade. H. C. Gardenhire, Jr., P. O. Box 271, Bartow, Florida.

WELL EQUIPMENT: New and used spudders, rotaries, core drills — all sizes and types. Cable tools, drill pipe, bits, pipe. Fishing tools. Everything for Well Service Pressey & Son, Pueblo, Colorado.

OIL FIELD MACHINE SHOP
FOR SALE

Modern, well equipped. At present location over 10 years. In center of producing and drilling area. For further details
Write: Box E252, Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT FOR SALE

FOR SALE: Used oil barges, excellent for conversion to drilling and material barges. Write Commercial Petroleum & Transport Co., 344 Esperson Building, Houston 2, Texas.

FOR SALE: Ideal slush pump, Model C-150. Melton Supply Company, Seminole, Oklahoma.

FOR SALE: Seamless casing and tubing new and second hand. Phone Rogers Pipe and Supply Co., Tulsa, Okla.

AMERICAN Structural Steel Building, 50′ x 77′ x 10′, Excellent Condition, Location: Shidler, Oklahoma. Alfred B. Kern, 223 Wright Building, Tulsa, Oklahoma.

CASING—TUBING

2500′ of 7″ OD, 17#, 8rd. thrd., R-2, used SS casing.

5000′ of 5½″ OD, 15.5#, 8rd. thrd., J-55 R-2, new SS casing.

12,000′ of 4½″ OD, R-2, used SS drill pipe casing, new 8rd. thrds, and new J-55 regular casing couplings, hydrostatically tested 2500#.

5,000′ of 4½″ OD, used SS drill pipe, beveled for welding.

4100′ of 2⅞″ OD, 6.50#, 8rd. thrd., EUE, R-2, used SS tubing.

12,000′ of 2⅜″ OD, 4.60#, 11½V thrd., 25′ lengths, regular used SS tubing.

BROWN PIPE & MACHINERY CO.
P.O. Box 2368, Phone 3-9391, Corpus Christi, Texas

FOR SALE

NATURAL GASOLINE PLANT AND 50-MILE PIPE LINE GATHERING SYSTEM

Plant operated until July 19, 1951—Formerly belonging to Engle Petroleum, Inc., at Benton, Illinois.

PLANT GAS CAPACITY—5,000,000 cu. ft. per day
PLANT PRODUCT CAPACITY—20,000 gallons per day

Pipe line gathering system (approximate):

2″ Pipe	147,397 ft.
2½″ Pipe	9,930 ft.
3″ Pipe	9,476 ft.
4″ Pipe	50,228 ft.
6″ Pipe	5,870 ft.
7″ Pipe	10,146 ft.
8″ Pipe	38,036 ft.
10″ Pipe	2,160 ft.
12″ Pipe	212 ft.

Interested parties 'phone, wire, or write Norman Strauss. We own these properties and can give immediate possession.

BROWN-STRAUSS CORPORATION

1546 Guinotte **'Phone Ha. 1000** **P.O. Box 78**
Kansas City 10, Missouri

FOR SALE
CASING AND TUBING

40,000′ #1 Used H-40, J-55 and Grade C 2⅜″ O.D., 4.60# Seamless 8 R.T. & 10 V.T., R-2.
Make Us an Offer
2,500′ #1 Used H-40 7″ O.D., 17# Seamless 8 R.T., R-1.
Priced to Sell
4,000′ #1 Used J-55 5½″ O.D., 14# Seamless 8 R.T., R-2.
Several lots of 5½″, 6⅝″, 7″ #1 Lapweld Casing

Attractively Priced

MICHIGAN CARLON PIPE CO.
20050 Livernois Ave., Detroit 21, Michigan
DIamond 1-1400

PIPE THREADING MACHINES

3—#8 Oster Rapiduction, 2½″ to 8″, 1942
2—6″ Landis, 2½″ to 6″, Late
1—8″ Landis, M/D, Late
1—2″ Landis, Late
1—#316 Oster, 1¼″ to 6″
1—#304 Oster, 1″ to 4″

O'Brien Machinery Co.
Div. A. 1545 N. Delaware Avenue
Philadelphia 25, Pa. GArfield 6-1150

BIG SALE
TENTS * TARPAULINS
COTS * BUNK BEDS

SKINNER CO.
1949 N. Kenmore Ave.
CHICAGO 14

FUEL OIL TANKS

Two 55,000 gal. capacity
One 80,000 gal. capacity
One 20,000 gal. capacity
Two 50,000 gal. water tanks on tower

RIVETED CONSTRUCTION
GOOD CONDITION

Write—Wire—Phone

X-746

EQUIPMENT FOR SALE

JUNIOR Model Wilson Double Drum Draw Works powered by Buda Model K425 motor, mounted on trailer with telescoping mast, platform, pipe rack, Oil Well rotary and swivel, block and hook, kelly, friction cat head. Drill to 3600—workover to 6000. Located in East Texas. $5000.00. Contact K. Dahl, 2415 Ave. G, Rosenberg, Tex.

FOR SALE: One Bucyrus-Erie 36 L Spudder three and one-half years old. Complete top to bottom tools 15½ to 5½. Also complete tailing in tools. All in first-class condition. List on request. J. E. Griggs, 310 East Third St., Mt. Carmel, Illinois. Phone 959.

FOR SALE: 1—1947 Model GMC Diesel Tandem 65 Tulsa Winch air equipped. 20-foot body, 12" Roller, 1100 x 22 tires, is good truck in top shape. Too large for this field. McCall & Sebastian, Drumright, Oklahoma.

2—Allis-Chalmers 12" x 12" type SE centrifugal all bronze pumps, 2500 GPM, 20' head 860 RPM. Direct connected to 2—150HP Allis-Chalmers explosion proof motors, 3 phase, 60 cycle, 220 and 440 volts, 860 RPM. Newman's Inc., 700 S. Maybell, Tulsa, Oklahoma, Phone 2-5228 or L. D. 635.

"OIL and Gas Leasing on the Public Domain" by Lewis Edwin Hoffman is a text book dealing extensively with research on Federal laws, forms, regulations and practices. Available at $7 each, exclusively through F. H. Gower, 321 First Natl. Bank Bldg., Denver, Colo.

CABLE RIG 6,000' Waukesha motor, Ensign carburetor on tandem, winch truck, Tonkawa, Oklahoma. Bargain $3,500.00. McLaughlin, 3506 West Pikes Peak, Colorado Springs, Colo.

SLIP ROLLS, 8" diameter, 6' long, ½" material, 10 HP slipring motor. Bargain. McLaughlin, 3506 West Pikes Peak, Colorado Springs, Colo.

WILSON Atlas Drawworks with compound, ready to work. Drum shaft will accommodate hydraulic brake. For sale $6,000 or will trade for 5" or 7" casing or 4½" drill pipe. Johnson Drilling Company, telephone 2-8323, Staley Bldg., Wichita Falls, Tex.

EQUIPMENT WANTED

WANTED AT ONCE: Two small rotary rigs complete, about size of Failing 1500—Prefer trailer mounted. Furnish equipment list, age, location and price. 508 Continental Bldg., Dallas, Texas.

WANTED: Gas Engine-Generator Unit. 175 KW gas engine driven unit, 440 volt, 60 cycle, 3 phase. Give engine and generator make, number of hours operation and type of service. Will consider used unit in good condition. Contact: Whitt Johnson, City of West University Place, Houston 5, Texas.

WANTED: Cable 2 MACHINE, depth 3500'. Complete with tools. Give price and location first letter. Box 198, Gorham, Kansas.

WANTED: A rotary, complete depth 6000'. Give price and location. Box 198, Gorham, Kansas.

WANTED

New and Used BOLTED TYPE STEEL TANKS

Also WELDED & RIVETED STEEL TANKS in all Sizes

Also New and Used STEEL CASING, TUBING & PIPE

Will Dismantle

Will pay highest prices

Please phone or wire collect

A. GREENSPON PIPE CO., INC.

(In business over 74 yrs.)

3615 Olive St., St. Louis 8, Mo., LUcas 5651

LEGAL BLANKS

BURKHART LEGAL BLANKS since 1908 Oil-Gas (all states), Business, Real Estate, Legal Forms, Leases, Revised With Government Regulations, Commercial Printing Catalog and Samples on request. Burkhart Printing & Stationery Company, 115 South Cincinnati, Tulsa 3, Oklahoma.

HELP WANTED

FOREIGN and Domestic Oil Employment Directory covering the oil industry, showing where to apply for jobs. Price $5.00. Oil Industry Mailing List, Box 2603, Tulsa, Okla.

REFINERY Office Manager and Internal Auditor for integrated Oil Company. Above average opportunity. Compensation commensurate with ability. Box E-261, The Oil and Gas Journal, Tulsa, Oklahoma.

TECHNICAL OIL WRITER with engineering degree and practical experience in drilling and petroleum engineering problems in Gulf Coast area. Position is in Houston and preferably the applicant should already reside there. Typing ability and writing-report preparation experience essential. Reply Box E-260, The Oil and Gas Journal, Tulsa, Oklahoma.

KEY Seismograph Personnel Needed by Established and Expanding Seismograph Company. Box E-264, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER, young mechanical, must have real writing ability. P. O. Box 2486, Kansas City 6, Missouri.

WANTED: Experienced Podbielniak operator. When applying furnish full details as to education and experience. New Mexico Asphalt and Refining Company, P. O. Box 367, Artesia, New Mexico.

Exceptional Opportunity for Materials Handling and Packaging

ENGINEER

Broad professional challenge for experienced man. Must be familiar with design, layout, installation, operation and servicing of efficient bulk handling and packaging facilities for such products as:

CARBON BLACK, FERTILIZERS, SULFUR, PLASTICS, SYNTHETIC RUBBER, LUBE OILS, FUELS, GREASES, PETROCHEMICALS

Responsibilities include consultation with technical personnel in methods and procedures; also with operating and sales departments of parent and subsidiary companies on current problems.

Excellent working conditions.
Attractive benefit programs.

Horizon unlimited
for the right man

Send complete summary of your experience to:

Phillips Petroleum Company

Employee Relations Department
Bartlesville, Oklahoma

HELP WANTED

CORROSION engineer, under 50, degree in electrical engineering, preferably experienced in pipe-line corrosion control. P. O. Box 2486, Kansas City 6, Missouri.

SEISMIC INTERPRETER: Permanent location in Edmonton, Alberta, Canada, interpreting records of two seismograph parties for major seismograph contracting organization. Starting salary based on experience; advancement opportunity; permanent position; employee know of this ad. Those qualified by having three or more years' experience interpreting seismograph records may apply by writing Box E-249, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER with at least 4 years' Refinery experience, including Crude Operations, Vacuum Operations, Catalytic Cracking and Polymerization. Midwest Refinery. Box E-259, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES engineers to represent hydraulic oil well pumping equipment in Mid-Continent area. Excellent opportunity for advancement. Give details of experience, education, age and availability in first letter. Confidential. Box E-242, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS Engineer who has had at least five years refinery experience. Southwest Refinery. Box E-232, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY PERSONNEL

Major company's refinery expansion in Louisiana provides opportunities for experienced technical and non-technical men. Positions open range from top process supervisors through instrument men, stillmen, and other refinery crafts. Give experience, education, age and salary expected. Replies kept confidential. Industrial Relations Department, P. O. Box #2, New Orleans, La.

Opportunity:
CHEMICAL ENGINEER or GRADUATE in CHEMISTRY
FOR CALIFORNIA

Century old firm looking for Chemical Engineer or graduate in Chemistry with B.S. or M.S. degree (preferably with experience in petroleum refining) for technical sales. Established line of chemical products used by petroleum industries and others. Salary open, give details, education, family, experience, photo if available.

Reply to
Box E-258
THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

OPPORTUNITIES FOR TECHNICAL REFINERY PERSONNEL
for
LARGE INTERNATIONAL OIL CO.

Entertaining applications of graduate chemical, mechanical, structural and electrical engineers for refinery engineering assignments at home and abroad.

Engineers with refinery experience and also recent graduates will be considered.

Box E-143, The Oil and Gas Journal, Tulsa, Oklahoma

HELP WANTED

AGGRESSIVE OIL EXECUTIVE — Substantial independent producing company wants aggressive, high type, responsible executive as Manager West Texas-New Mexico Division. Applicant should be under 35 years of age, 10 years experience land and geological work preferably West Texas-New Mexico area. Applicant must be equipped to find and negotiate for wildcat, undeveloped, and developed properties and leases, appraise submittals, manage present West Texas office. Excellent compensation. When replying give full details, include photograph. Our present employes not considered for this position. Box E-194, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMOGRAPH. Excellent opportunity for experienced geophysicist with aggressive independent contract company to supervise contract crew in Texas. Salary dependent on experience. Write giving details, all replies held strictly confidential. Box E-246, The Oil and Gas Journal, Tulsa, Okla.

MECHANICAL Engineer who has had actual supervisory experience in refinery of machine shop, pump, engine and turbine repair. Southwest refinery. Box E-231, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: Junior, with minimum two years sub-surface experience, required for work in Persian Gulf area. One year contract, allowances include transportation, single housing, and subsistence. Write giving age, education, martial status, and full details of past experience to American Independent Oil Company, 111 Sutter Street, San Francisco 4, California.

MAGNETOMETER operator, foreign work. Top salary, subsistence, family living allowance, traveling expenses. Excellent conditions and climates. Our personnel has been notified. Apply Box E-263, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN gravity-magnetic supervisor. Must be of standing in field. Top salary, subsistence, family living allowance and travel expense. Best working conditions. Our personnel has been notified. Apply Box E-262, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PRODUCTION MAN NOW AVAILABLE—Experienced in: drilling; completion; flowing wells; pumping wells; workovers; salt-water disposal; secondary recovery. Box E-238, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED Gas Engineer desires change in location. Registered in Texas. 22 years' experience. Familiar with all phases natural gas, gasoline plant, cycling plant, and gas transmission line work. Desire location in Southwest. Would consider foreign. Minimum salary $8000.00 Domestic, $10,000 Foreign. Box E-239 The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, operating as an independent, wishes to become associated with company, individual, or group on a salary-interest basis. Have been associated with the oil industry better than fifteen years in geological and geophysical exploration, development, leasing, and other phases of operation, and should be an asset to one needing an experienced man. Capable of planning program and directing operations. Interview to be arranged. Box E-245, The Oil and Gas Journal, Tulsa, Oklahoma.

MANAGEMENT Engineer—Foreign refining background, performance record international oil companies engineering-operating-management refineries, pipelines, terminals, Latin America, Middle East. U. S. citizen, age 37. Box E-265, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST — Nine years experience Texas and Louisiana Gulf Coast, subsurface, surface, geophysical interpretation, managing exploration program, desires connection with independent operator or small company. Box E-267, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER-LAWYER: B.S., LL.B. degrees, registered engineer. Age 30. 5 years oil industry; 2½ years field experience, 3 years drilling and production equipment. Wants position engineering or legal or combination with oil company or independent. Box E-256, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

DRILLING Contractor operating in West Texas and New Mexico desires to contact small or medium-sized independent oil company who needs an operating manager. Personal interview desired. Twenty years experience in all phases of the oil industry. Address replies to Box D-644, The Oil and Gas Journal, Tulsa, Oklahoma.

PLANT SUPERINTENDENT
Competent and experienced. Excellent record of efficient operations, maintenance and construction. Box E-229, The Oil and Gas Journal, Tulsa, Oklahoma.

DESIGN Engineer, 20 years experience refineries, power plants, piping, structures, mechanical equipment, 8 years centrifugal pumps, age 45, married, no children, desires position South America. Box E-226, The Oil and Gas Journal, Tulsa, Oklahoma.

MATERIAL ACCOUNTANT, Inventory, Purchasing, Liaison, Joint Interest. Interview desired. Now employed. Box E-227, The Oil and Gas Journal, Tulsa, Oklahoma.

ADVERTISER looking for position where technical, commercial and administrative abilities and experience required. Past experience refining, terminal operations, construction, technical service and sales. University graduate, linguist, excellent references. Presently employed. Box E-228, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST desires return to foreign employment. Total of 22 years foreign experience. Last 13 years in Latin America with major oil company; previous 9 in Near East. Box E-230, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED Production and Drilling Supt. on both Rotary and Cable Tools, Deep and Shallow wells, work over and completion, Material, Equipment, routine office duties. 39 years of age. Best reference. Box E-234, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTORNEY, 6 years land department major company, specialist in drafting oil development contracts, desires change. Box E-248, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: 15 years experience West Texas and New Mexico desires position with major independent oil company. Box E-250, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROCHEMICAL superintendent, twenty years in all phases refining and petrochemicals, desires permanent position with independent refinery or petrochemical plant in south or southwest. All offers considered. Box E-257, The Oil and Gas Journal, Tulsa, Oklahoma.

INDEPENDENT oil operator with outside income, 35 years old, married to attorney, would like position foreign country with oil company or government. Speaks French, Spanish, German and Italian. Thirteen years experience in land, seismograph crew supervision, drilling, producing, and developing Texas Gulf Coast. Three years college education. Wants to get away from high tax but would not consider anything less than a two year contract. Write Box E-244, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico Personal interview by appointment is desired. Makin Drilling Company, Box No 131, Ph. No. 131, Hobbs, New Mexico.

FORMER Independent Oil Operator ten years, with legal education, plus eight years Wall Street experience, desires connection raise funds exploratory well drilling from excess profits taxpayers. Box D-938, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE ASSISTANT
PETROLEUM ENGINEER

Graduate engineer, age 36, presently employed as tool pusher on drilling rig. Eight years' sales and administrative experience and technical training. Capable assuming full responsibilities.

Box E-266, The Oil and Gas Journal, Tulsa, Oklahoma

LEASE AND DRILLING BLOCKS

OKLAHOMA—Le Flore Co., 12,562 acres, all oil rights—sell $6.50 per acre, details Earl Jester, 12744 Vanowen, North Hollywood, Calif.

FOR SALE: Strip mine in Kentucky. Plenty coal to strip. Priced at bargain. Write or Wire. Harvey Daugherty, Horse Branch, Ky.

ACREAGE: Twenty thousand acre block, large anticline, well defined closed dome, geological report and maps of structure, southwestern Idaho and eastern Oregon. I. L. Burch, 2107 West Blvd., Los Angeles 16, Calif.

FOR SALE: 2000 acre block of oil leases in Shelby County, Texas, well located, priced $2 per acre. Write for information to C. A. Parker, Office Polley Hotel, Center, Texas.

FOR SALE: 50 acre, 10 year lease, Shelby County, Texas, situated in Humble Block, now ready for development. Write for details. C. A. Parker, Office Polley Hotel, Center, Texas.

WANTED: PROVEN LEASES
Proven leases on upper Gulf Coast and East Texas wanted for drilling. Finances and casing available to develop proven leases if not too heavily loaded with bonuses or overrides. Map showing acreage, together with subsurface information, or geology, that indicates profitable oil production, together with guarantee you are able to assign acreage, if a satisfactory deal can be worked out, must be furnished. Will only deal with one person in position to make a deal, and will not entertain nebulous or fragmentary deals. Box E-215, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL Leases in Trigg County, Ky., surrounding drilling well, just started. Priced to sell. (Geology L.V.I.) C. P. Taneyhill, Industrial Engineer, P.O. Box 304, Bowling Green, Kentucky.

WILL sell 40 acres full participating royalty under N2 of SW and SE of SW 33-19-8 Creek County adjoining Gulf Oil Corp. location, priced $40.00 an acre. C. W. Mandler Commercial Bank Bldg., Muskogee, Oklahoma.

FOR SALE: My ¼ interest assignment 31¼ acres in 125 acre block in Fayette County, Texas. 10 year lease starting from May 9, 1951. Close to big Oil Play. Write Earl Grissom, Box 316, Corpus Christi, Texas, or phone 2-9102.

FOR SALE: Oil and Gas Leases adjoining producing leases, also wildcat leases, drilling propositions and small producing properties; all in shallow territory. W. P. Harley, Bowling Green, Ky.

FOR LEASE and Surface for Sale: South ½ Section 78, Block 6, Stephens; North ½ Section 12, Block A 22, Gaines counties, Texas. L. J. Simmons, Westville, Oklahoma.

OIL FIELDS
S.E. NEW MEXICO

Active drilling operations on Major Oil Structures indicate opening of important oil fields. Our recommendations of vital interest to oil men and royalty; also lease buyers. Details on request.

W. J. PETERMAN, Geologist
Portales, New Mexico

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited

B. D. BUCKLEY
6633 Delmar Ave., St. Louis 5, Mo.

BUSINESS OPPORTUNITIES

YOUR FINANCING PROBLEM can be solved at moderate cost. For details write Box E-241, The Oil and Gas Journal, Tulsa, Oklahoma.

NOTICE Capital Investors: I will act as your buying agent for oil and gas properties in Texas, Oklahoma, New Mexico, Montana, and Louisiana. At this time we have 42 pieces of producing oil properties for sale. Charlie Priolo, 2301 West 6th, Amarillo, Texas.

REAL ESTATE

Gunnison, Colo., Ranch

FOR SALE: 1324 acre outfit that will carry 300 cattle year round. In lush cattle country, right next to Public Domains for which it carries a wonderful permit. It's famous hunting and fishing country. **A ranch paradise** that would make an ideal private club; or with little effort could be made an ideal resort. The beautiful modern house with latest equipment has 7 bedrooms and 5 bathrooms. It will be sold partly furnished. 2 modern tenant houses and all the necessary supporting buildings in good condition. This will sell quickly so don't wait—write us now.

30-Bedroom Hotel

FOR SALE: Modern 30 bedroom hotel in Republican Valley, Nebraska. Room for expansion. All brick structure, air cooled; 4 single baths; 8 connecting baths; hot and cold running water in each room. Fully equipped kitchen and dining room. Region just being developed for irrigation and near one of Nebraska's largest recreation spots. On main route attracts year round commercial business. Extensive oil development in the area, number of wells producing. Priced for immediate sale.

Bailey, Colo., Outfit

FOR SALE: 480 acres with 40 of it in good hayland, right on a paved highway. Modern 7-room house on the place in excellent condition; tenant house and supporting buildings. A lake for fishing; ¼ mile of Platte river runs thru the place. Just 1 hour's drive from Denver. Will be "snapped-up" by first person to see it.

WESTERN Realty Co.
REALTORS
C. A. (Chuck) Bresnahan—Manager
400 Livestock Exchange Bldg.
DENVER Phone KE 6313

ROYALTIES

PRODUCING ROYALTY: 10 acres Noble County, Oklahoma, under 320 acres. 8 months average $15 per acre per month return. Six undrilled locations. Priced for immediate sale $7500. U/S Associates, 619½ South LaBrea, Los Angeles.

WELL FISHING AND HANDLING TOOL—Mechanism powered within the tool, positive manual or automatic action controlled at surface, operable on cable or drill pipe. Grips either the outside or inside of objects. Will consider advanced royalty basis for Manufacturing Rights under patent pending. Box E-222, The Oil and Gas Journal, Tulsa, Okla.

PRIVATE PARTY will invest to $200,000 cash in producing Royalties, overrides or settled production in small or large deal. Box E-236, The Oil and Gas Journal, Tulsa, Oklahoma.

MONTANA ROYALTIES

Millions of acres now leased by world's major companies, with huge drilling play in prospect. For booklet describing Montana geology and oil development, write Landowners Royalty Company, Box 1225, Great Falls, Montana.

WANTED

CAPITAL NEEDED for drilling test on large acreage on very favorable oil and gas structure in Pennsylvania. Structure is geologically good on Oriskany. Principles only. Box E-247, The Oil and Gas Journal, Tulsa, Oklahoma.

WANT CAPITAL for drilling venture in return for half interest. Have Fort Worth Spudder Type H, 2000' of good casing, 2 International trucks, and 590 acres in Rogers County, Oklahoma, Sec. 17: T-22, R15. Joe H. Brewer, Oologah, Oklahoma.

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Titterington Appointed Sales Vice President

Yale W. Titterington, formerly with Dow Chemical Co. and its subsidiary, Dowell Incorporated, for 9 years in research, development, and sales work on cathodic protection and magnesium anodes, has been appointed vice president in charge of sales for Standard Magnesium Corp., of Tulsa. In this new capacity, Titterington will devote his time primarily to the recommendation and sales of magnesium anodes. His headquarters will be in Tulsa.

Calumet & Hecla Elects Heitkamp as Director

The board of directors of Calumet & Hecla Consolidated Copper Co. has elected Frederick B. Heitkamp as a director. Heitkamp, vice president in charge of planning and performance of Daystrom, Inc., is also a director of that company. In addition he is a member of the board of all of Daystrom's associated companies.

Heitkamp came to American Type Founders, now a subsidiary of Daystrom, in April 1936 as vice president in charge of sales.

La.-Ark. Fields

(Continued from page 131)

NORTH LOUISIANA WILDCAT FAILURES

LaSalle Parish: J. S. Michael et al 1 Nebo Oil Co. "N," C NE SE 10-7n-2e, dry, TD 4,517 ft.

Webster Parish: Monarch Petroleum Corp. 1 Hortman, SE SE NW 15-20n-10w, dry, TD 3,486 ft.

ARKANSAS WILDCAT FAILURES

Ouachita County: McAlester Fuel Co. 1 Rumph "A," 330 ft. S and W NEc NE NW 24-14s-17w, dry, TD 2,813 ft.

Union County: Shell Oil Co. 1 U.S.M., NE SE NW 10-17s-12w, dry, TD 3,305 ft.

LEGAL

1,120 ACRES of Tribal Indian lands located in Townships 5 and 6 South, Range 9 West, within the jurisdiction of the Uintah and Ouray Reservation, Utah, are being advertised for lease, bids on which will be opened August 9 at 2:00 P.M., at the office of Forrest R. Stone, Superintendent, Uintah and Ouray Agency, Fort Duchesne, Utah. Full particulars may be obtained from Mr. J. R. Schwabrow, U. S. Geological Survey, Casper, Wyoming, or from the Uintah and Ouray Agency.

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NATIONAL TANK COMPANY

• 1926 • 25 YEARS OF SERVICE • 1951 •

BUILT FOR THE JOB!

National High Pressure Separators exemplify the ruggedness, engineer-designing and production "know-how" built into all National equipment.

National High Pressure Separators are used in many types of high pressure producing plans including multi-stage installations and distillate recovery plants; for scrubbers on high pressure wet gas streams, for "Foaming" oil, etc.

National's complete range of High Pressure Separators includes various capacity vessels up to 4,000 lbs. working pressure.

If "It's a National," it has fine quality.

It's a National

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

More Scrap! More Steel!!

AMERICA expects the steel industry to produce more steel this year. More steel requires additional scrap. Steelmakers need the help of all steel users to get every possible extra pound of scrap to meet the nation's call for more steel production. We urge you to do your part. Turn in your scrap through your regular channels.

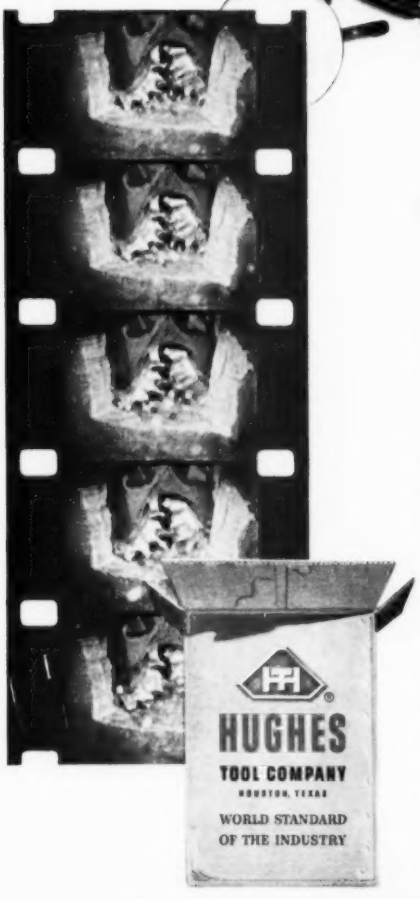
YOUR SCRAP IS NEEDED — YOUNGSTOWN

The Youngstown Sheet and Tube Company

General Offices – Youngstown 1, Ohio
Export Offices – 500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.



BIT ACTION IN *SLOW MOTION*

Motion pictures, taken at 3000 frames per second—*100 feet in two seconds*—are being used to study bit performance at the Hughes research laboratory.

Focused on a bit drilling in a test block, the high speed camera records, in the slowest of slow motion, just how the bit teeth bite into the formation... shows the effect of tooth structure, tooth spacing and other design features on drilling efficiency.

Details, impossible to see with the naked eye, become crystal clear when the high speed film is projected on the screen.

This is only one of the many modern tools used by Hughes research engineers in studying rock bit performance. Supplemented by data obtained from millions of bits run on thousands of rigs, this research information enables Hughes to design and build the industry's best rock bits.